The background image shows a massive, white-capped wave crashing onto a light-colored sandy beach. The water is a vibrant turquoise color. The sky above the horizon is clear and blue.

Нейронные сети на JS// А зачем?



О себе

JS Backend developer

Мой путь: C - PHP- Python - JS

Пробовал: C++, Ruby, Go, Scala, Haskell

Нравится все новое и хайповое

Два года пытаюсь в свободное время
заниматься NLP

Участвовал в MlonCode, занимаюсь в
свободное время анализом Js кода



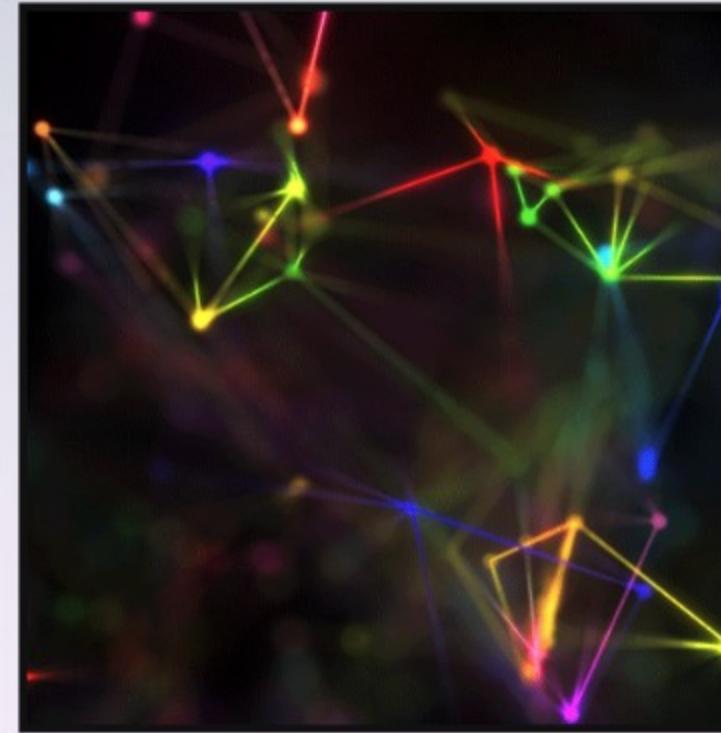


WHYYYY



Что я расскажу

1. Причины, зачем JS девелоперу это
2. Основные тренды в нейронных сетях
3. Основные инструменты для JS
4. Мотивирующие примеры



Я не буду объяснять, что
такое нейронная сеть.



Причины



Почему JS

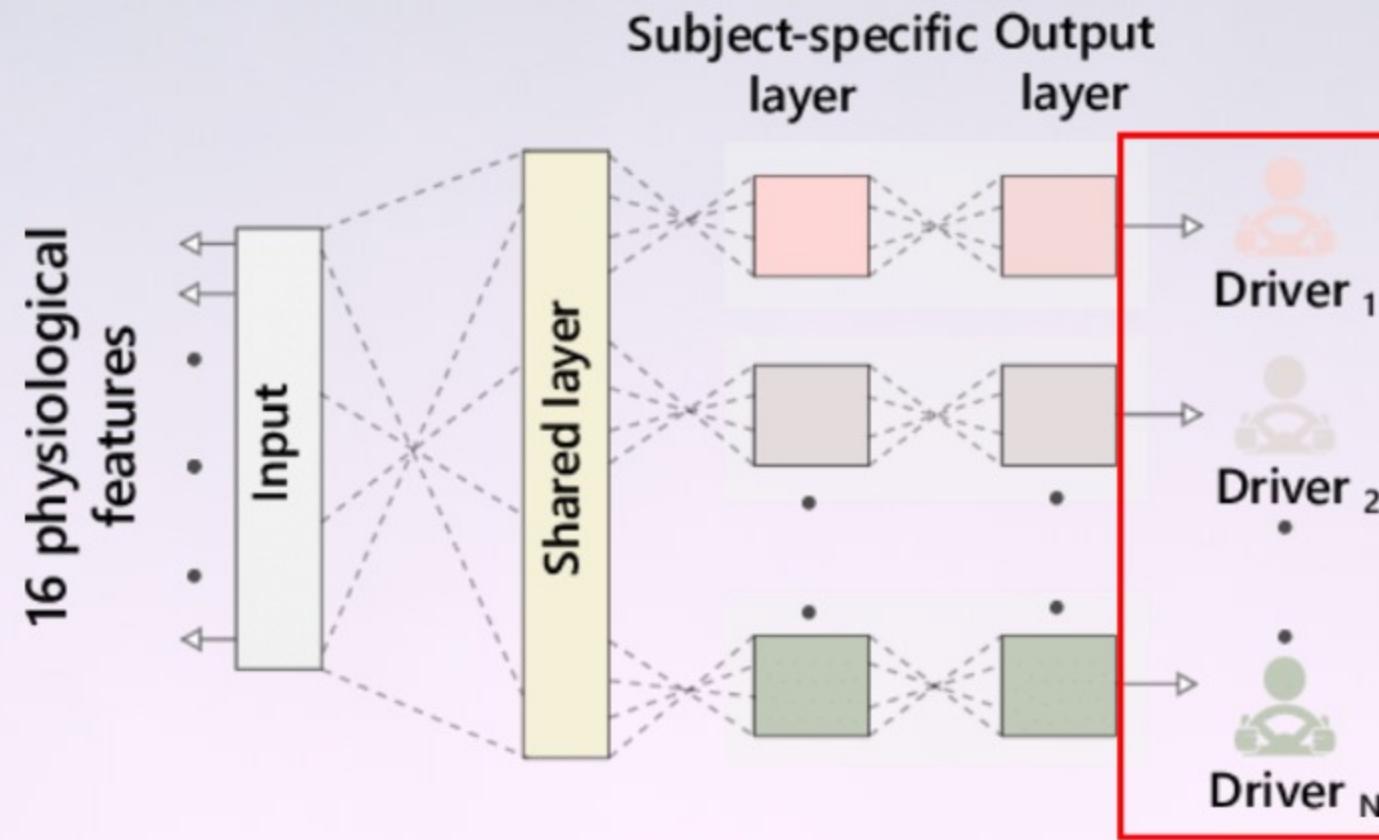
1. Не надо изучать новый язык
2. Есть инструменты
3. Есть практическое применение
4. Чем больше проектов на JS, тем
больше JS связан с будущим

Меняйтесь раньше, чем вас
заставят это сделать.

Джек Уэлч



Последняя миля





Тренды



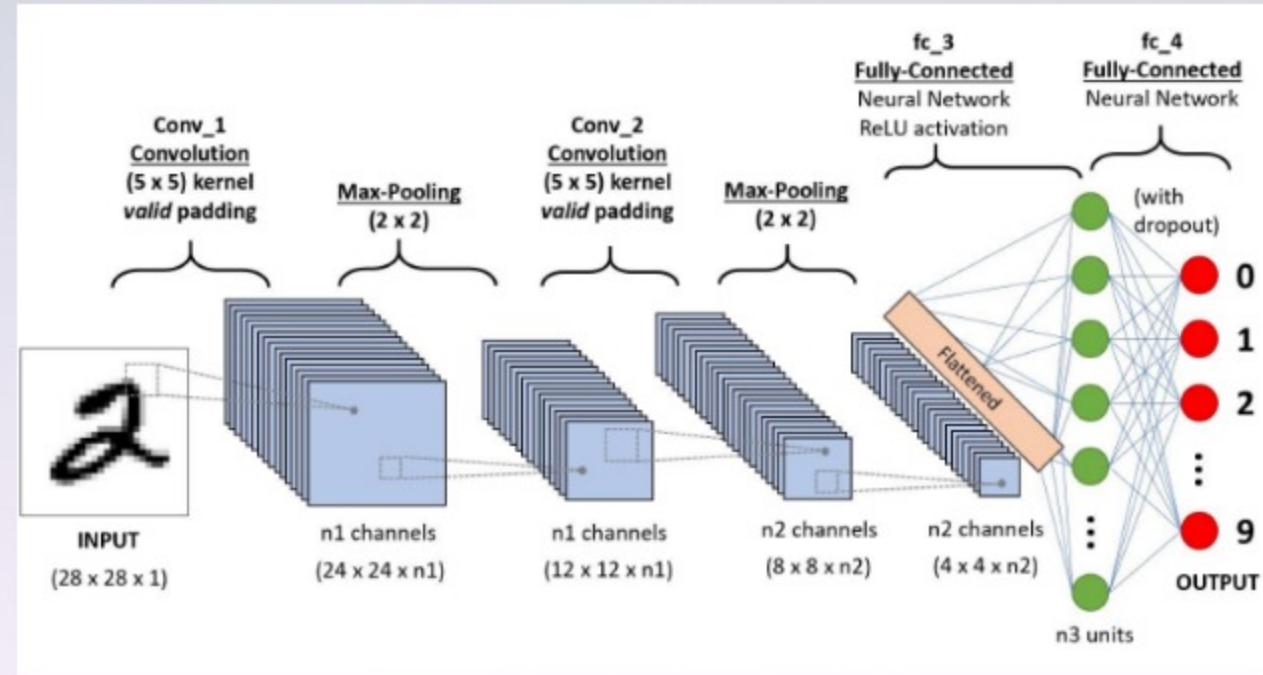
Типы применения

1. Computer vision
2. Audio
3. NLP
4. Video
5. Code
6. Logs



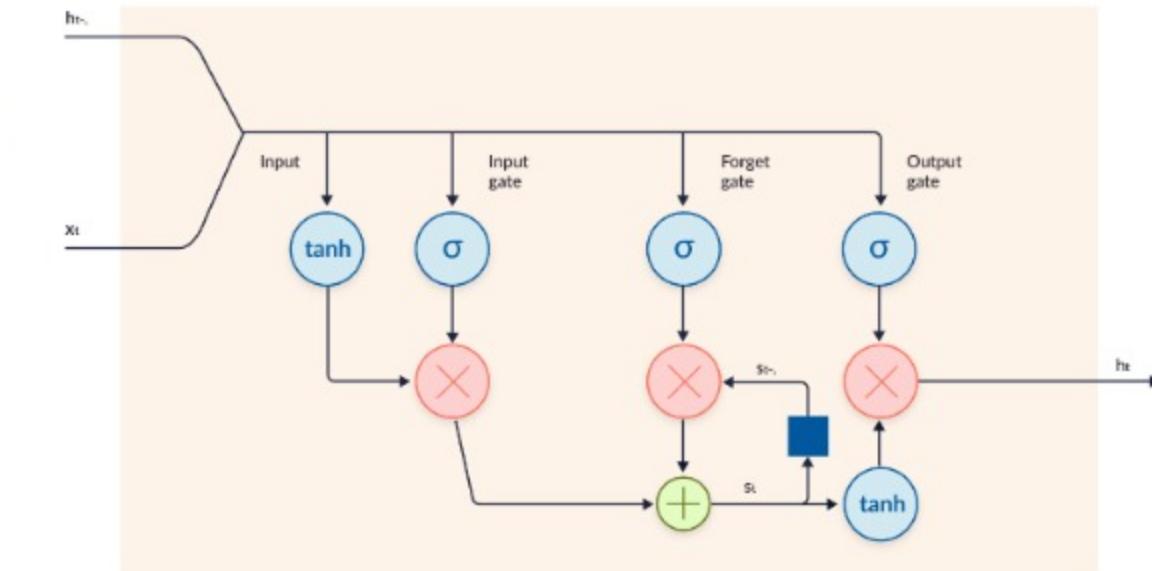


2010 - ImageNet, ILSVCR

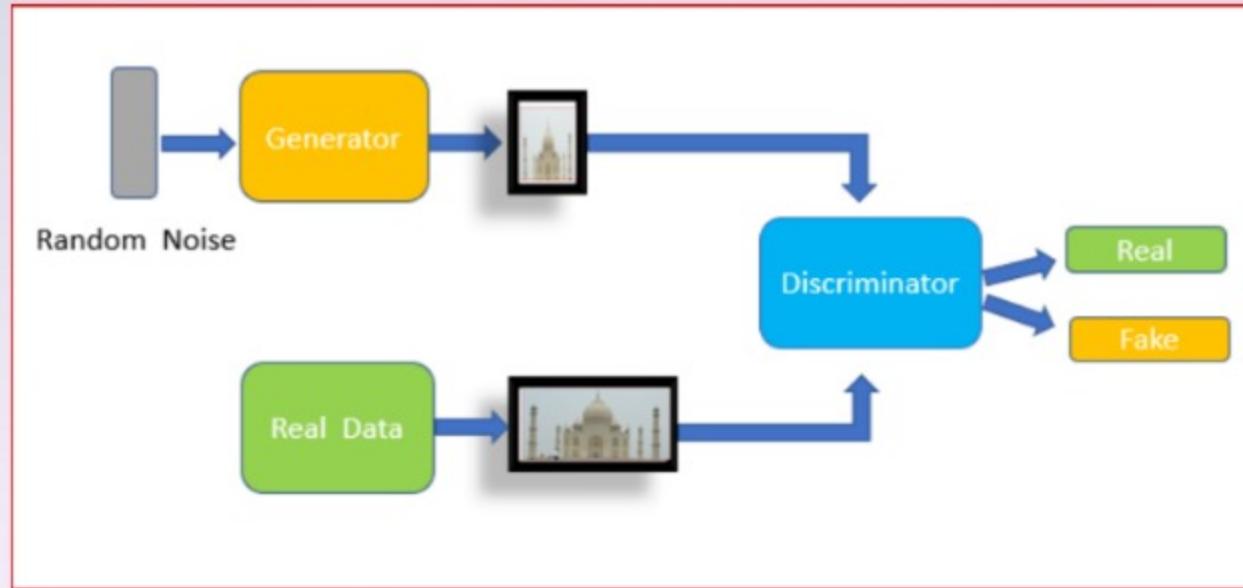


2012 - CNN(16%)



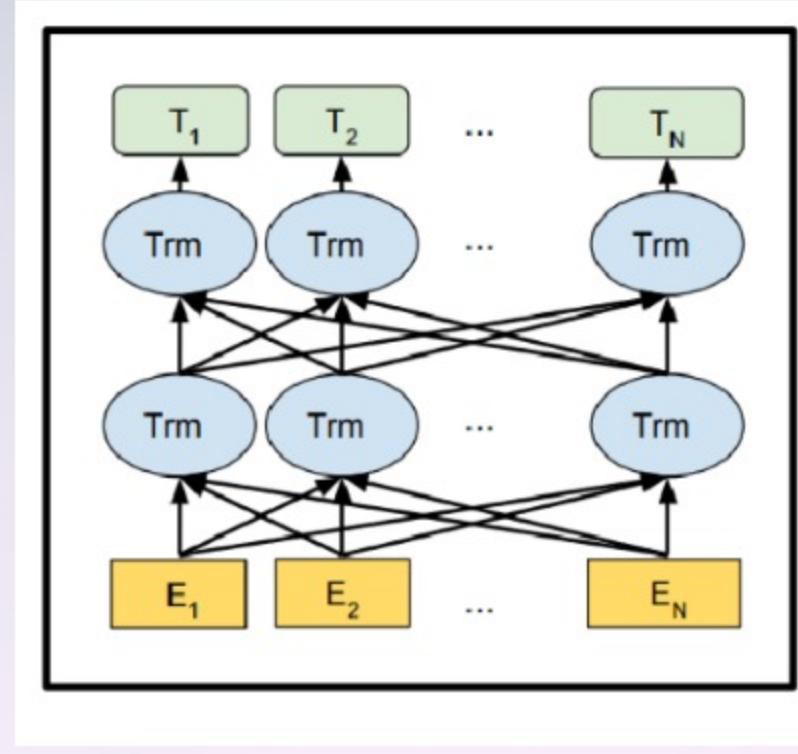


2015 - LSTM
(Google Voice - 49%)



2017 - GAN
(2018 - Grand Pale)

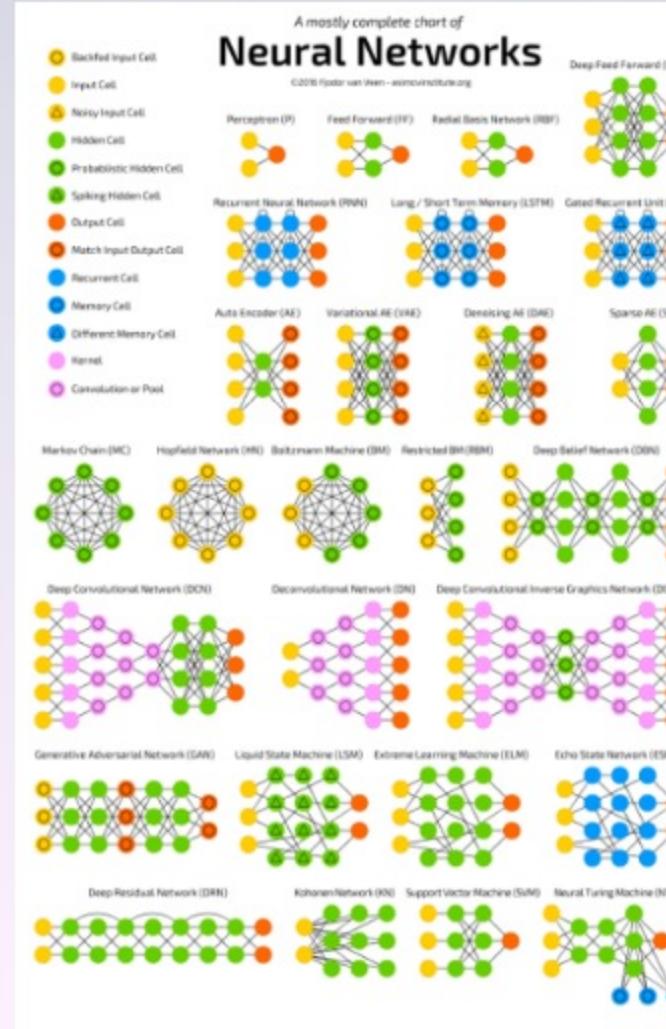


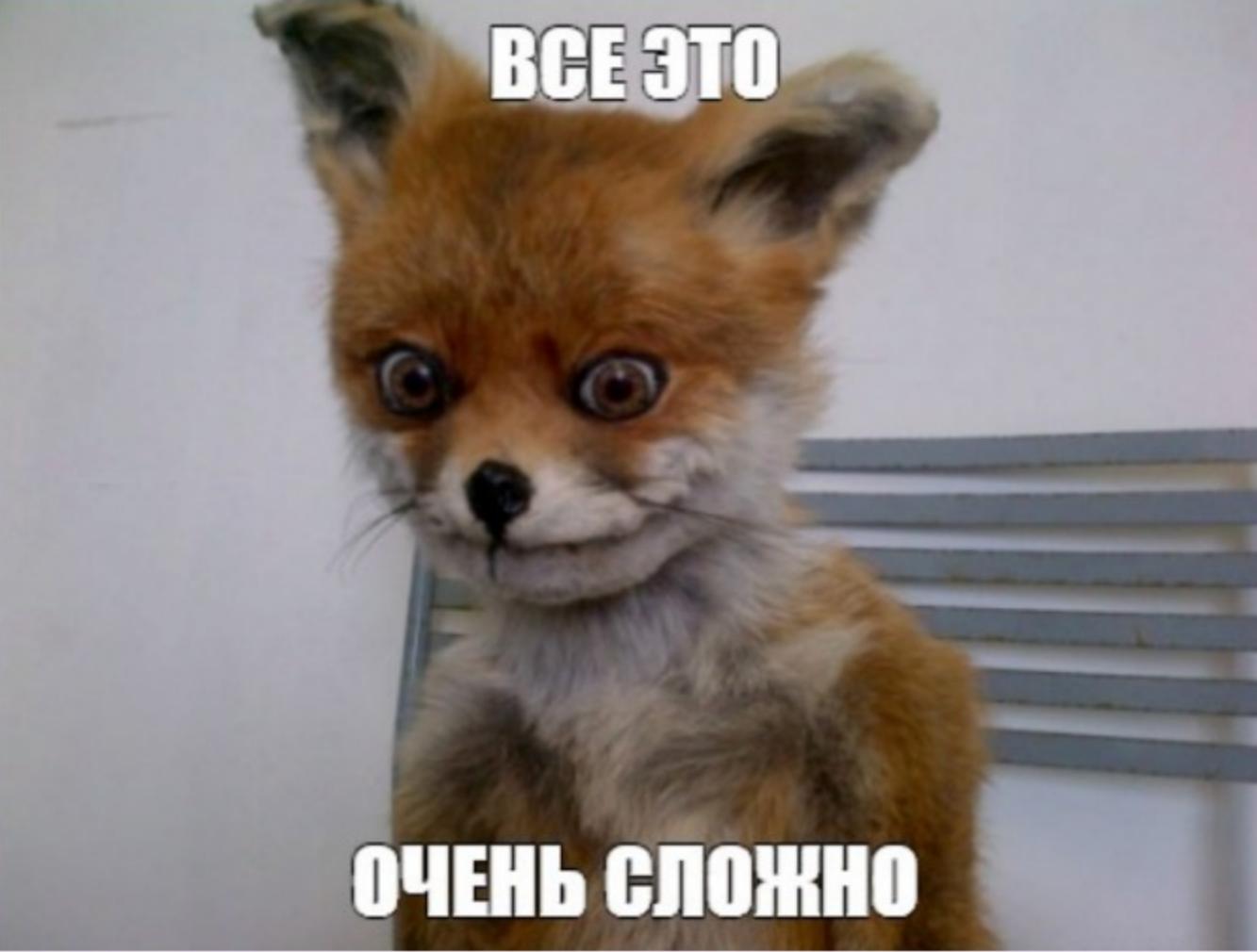


2019 - BERT

(Google Search, SQuAD - 93,2%)







ВСЕ ЭТО

ОЧЕНЬ СЛОЖНО



Реальный пример

```
from keras.models import Sequential
from keras.layers import Dense
from keras.utils import np_utils
import numpy
import pandas as pd
COLUMN_NAMES = ['SepalLength', 'SepalWidth', 'PetalLength', 'PetalWidth', 'Species']
training_dataset = pd.read_csv('iris_training.csv', names=COLUMN_NAMES, header=0)
train_x = training_dataset.iloc[:, 0:4].values
train_y = training_dataset.iloc[:, 4].values
encoding_train_y = np_utils.to_categorical(train_y)

test_dataset = pd.read_csv('iris_test.csv', names=COLUMN_NAMES, header=0)
test_x = test_dataset.iloc[:, 0:4].values
test_y = test_dataset.iloc[:, 4].values
encoding_test_y = np_utils.to_categorical(test_y)

model = Sequential()
model.add(Dense(10, input_dim=4, activation='relu'))
model.add(Dense(10, activation='relu'))
model.add(Dense(3, activation='softmax'))

model.compile(loss='categorical_crossentropy', optimizer='adam', metrics=['accuracy'])
model.fit(train_x, encoding_train_y, epochs=300, batch_size=10)
scores = model.evaluate(test_x, encoding_test_y)
```





Инструменты



A WebGL accelerated, browser based JavaScript library for
training and deploying ML models.



Особенности

1. Похож на Keras
2. Использует GPU через Canvas
3. Можно выгружать в Web-Worker
4. Можно использовать keras, pytorch
модели
5. Handwritten -
<https://codelabs.developers.google.com/codelabs/tfjs-training-classification/index.html#4>

Особенности

Smaller models

Model	WebGL	WASM	CPU	Memory
BlazeFace	22.5 ms	15.6 ms	315.2 ms	.4 MB
FaceMesh	19.3 ms	19.2 ms	335 ms	2.8 MB

Larger models

Model	WebGL	WASM	CPU	Memory
PoseNet	42.5 ms	173.9 ms	1514.7 ms	4.5 MB
BodyPix	77 ms	188.4 ms	2683 ms	4.6 MB
MobileNet v2	37 ms	94 ms	923.6 ms	13 MB



```
import * as tf from '@tensorflow/tfjs';
const model = tf.sequential();
model.add(tf.layers.dense({inputShape: [4], units: 100}));
model.add(tf.layers.dense({units: 4}));
model.compile({loss: 'categoricalCrossentropy', optimizer: 'sgd'});
await model.fit(
  xData, yData, {
    batchSize: batchSize,
    epochs: epochs
});|
```



```
// functions to handle socket events
socket.on('connect', () => {
  document.getElementById('trainingStatus').innerHTML = 'Training in Progress';
});

socket.on('accuracyPerClass', (accPerClass) => {
  plotAccuracyPerClass(accPerClass);
});

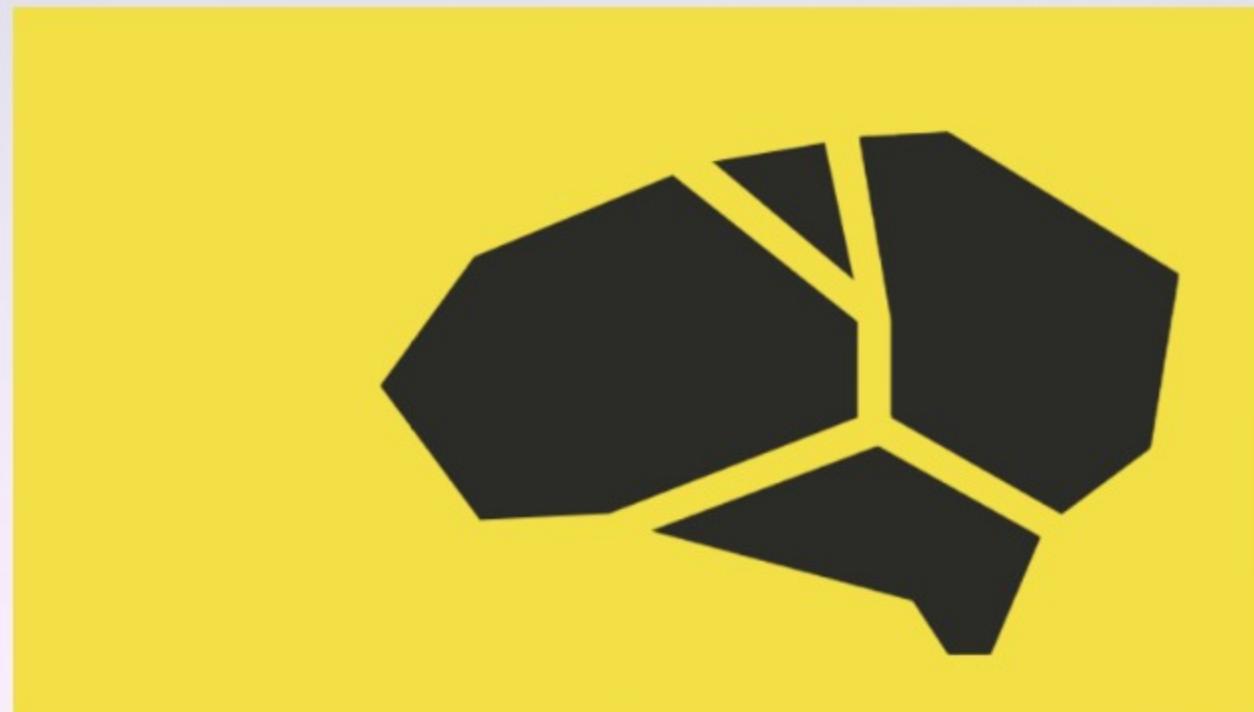
socket.on('trainingComplete', () => {
  document.getElementById('trainingStatus').innerHTML = 'Training Complete';
  document.getElementById('predictSample').innerHTML = '[' + testSample.join(', ') + ']';
  predictContainer.style.display = 'block';
});

socket.on('predictResult', (result) => {
  plotPredictResult(result);
});

function plotPredictResult(result) {
  predictButton.textContent = 'Predict Pitch';
  predictButton.disabled = false;
  document.getElementById('predictResult').innerHTML = result;
  console.log(result);
}
```



Brain.js



Это важно, потому что

1. Использование GPU как демо
2. С 2010
3. Легкий в усвоении, если не знаешь Keras
4. Основные типы нейронных сетей есть
5. Typescript
6. 648 kb



```
const net = new brain.recurrent.LSTM()

net.train([
  'doe, a deer, a female deer',
  'ray, a drop of golden sun',
  'me, a name I call myself',
])

const output = net.run('doe') // ', a deer, a female deer'
```



```
const networkTypes = {
  NeuralNetwork: () => {
    return new brain.NeuralNetwork(config);
  },
  RNN: () => {
    return new brain.recurrent.RNN(config);
  },
  RNNTimestep: () => {
    return new brain.recurrent.RNNTimestep(config);
  },
  FeedForward: () => { // constructor shim
    const { input, feedForward, target } = brain.layer;
    return new brain.FeedForward({
      inputLayer: () => input({ height: config.inputSize }),
      hiddenLayers: config.hiddenLayers.map((l) => (inputLayer) => feedForward({ height: l })),
      outputLayer: inputLayer => target({ height: config.outputSize }, inputLayer),
    });
  },
};
```



*ml*5

ML5.js



Преимущества

1. Очень простой
2. Высокоуровневый
3. Над Tensorflow.js
4. Много готовых заготовок
5. Размер - 1,5 mb
6. Face-api - 700kb, MNIST - 200kb, MobileNet -2 mb

```
// Initialize the Image Classifier method with MobileNet
const classifier = ml5.imageClassifier('MobileNet', modelLoaded);

// When the model is loaded
function modelLoaded() {
  console.log('Model Loaded!');
}

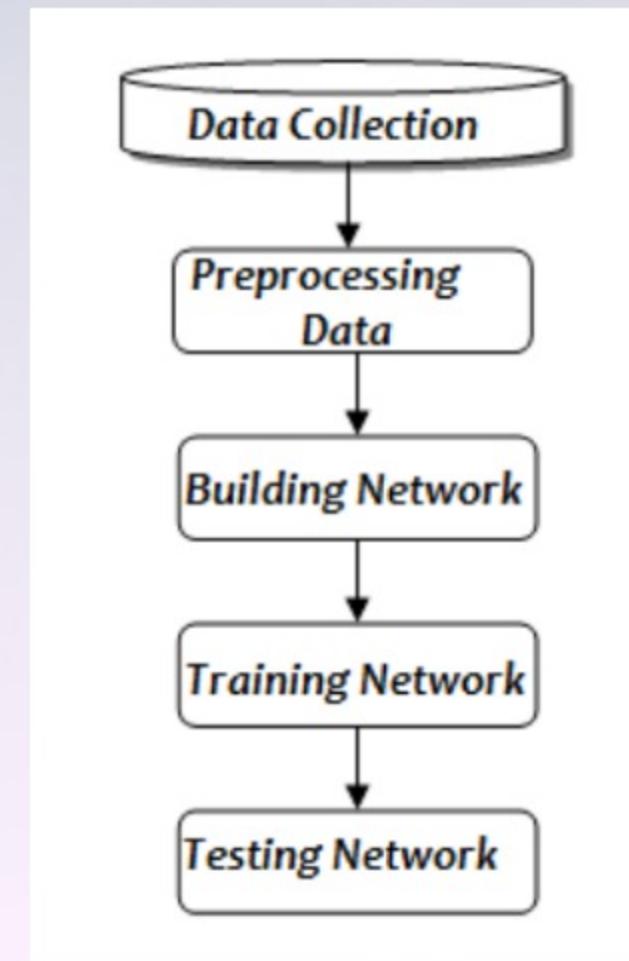
// Make a prediction with a selected image
classifier.classify(document.getElementById('image'), (err, results) => {
  console.log(results);
});
```



Еще!

1. Stdlib-js
2. Machinelearn.js
3. Math.js
4. Face-api.js
5. R-js
6. Natural





Загрузка данных



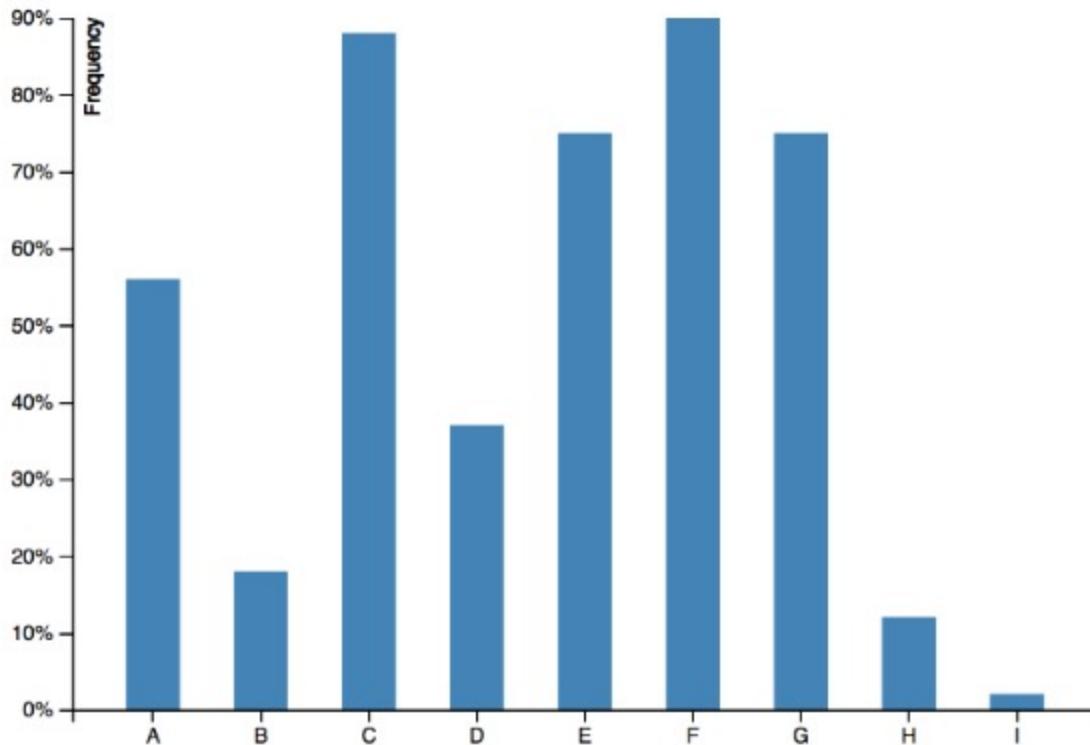
nexts n]

```
▼ (21116) [{...}, {...}, {...}, {...}, {...}, {...}, {...}, {...}, {...}, {...}, {...}, {...}, {...}, {...}, {...}]

  ▼ [0 ... 9999]
    ▼ [0 ... 99]
      ► 0: {event_date: Thu Nov 13 2008 00:00:00 GMT+0000 (GMT)}
      ► 1: {event_date: Sat Oct 04 2008 00:00:00 GMT+0100 (BST)}
      ► 2: {event_date: Tue Nov 04 2008 00:00:00 GMT+0000 (GMT)}
      ► 3: {event_date: Tue Nov 18 2008 00:00:00 GMT+0000 (GMT)}
      ► 4: {event_date: Fri Oct 17 2008 00:00:00 GMT+0100 (BST)}
      ► 5: {event_date: Thu Nov 27 2008 00:00:00 GMT+0000 (GMT)}
      ► 6: {event_date: Mon Oct 06 2008 00:00:00 GMT+0100 (BST)}
      ► 7: {event_date: Mon Nov 10 2008 00:00:00 GMT+0000 (GMT)}
      ► 8: {event_date: Fri Oct 03 2008 00:00:00 GMT+0100 (BST)}
      ► 9: {event_date: Wed Nov 12 2008 00:00:00 GMT+0000 (GMT)}
      ► 10: {event_date: Fri Nov 21 2008 00:00:00 GMT+0000 (GMT)}
      ► 11: {event_date: Sun Oct 05 2008 00:00:00 GMT+0100 (BST)}
      ► 12: {event_date: Mon Nov 24 2008 00:00:00 GMT+0000 (GMT)}
      ► 13: {event_date: Wed Oct 08 2008 00:00:00 GMT+0100 (BST)}
      ► 14: {event_date: Mon Nov 03 2008 00:00:00 GMT+0000 (GMT)}
      ► 15: {event_date: Mon Nov 03 2008 00:00:00 GMT+0000 (GMT)}
      ► 16: {event_date: Wed Nov 05 2008 00:00:00 GMT+0000 (GMT)}
      ► 17: {event_date: Sun Nov 23 2008 00:00:00 GMT+0000 (GMT)}
```



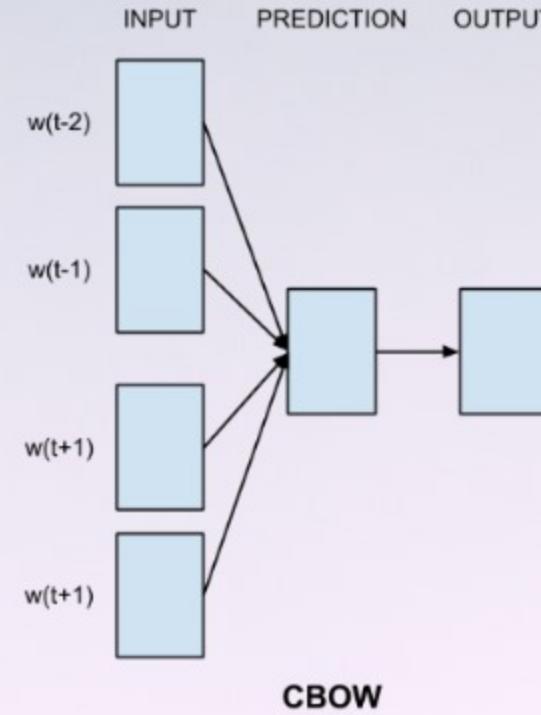
data1.json data2.json



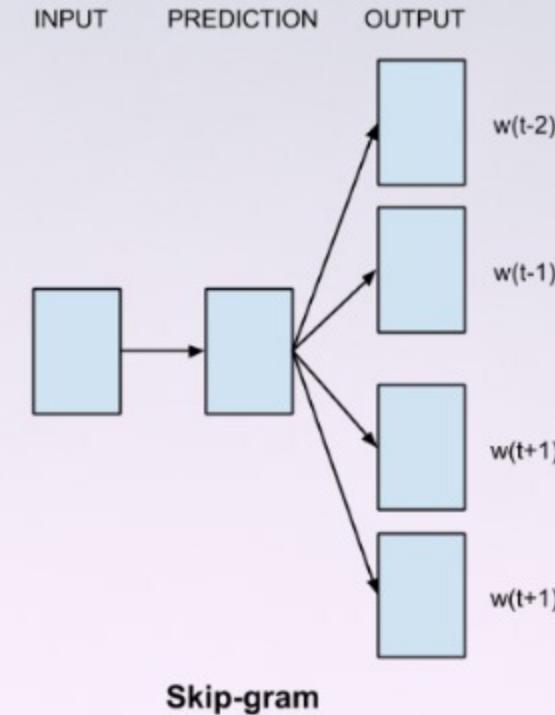


D3, Pandas.js, Data-forge,
dataframe-js



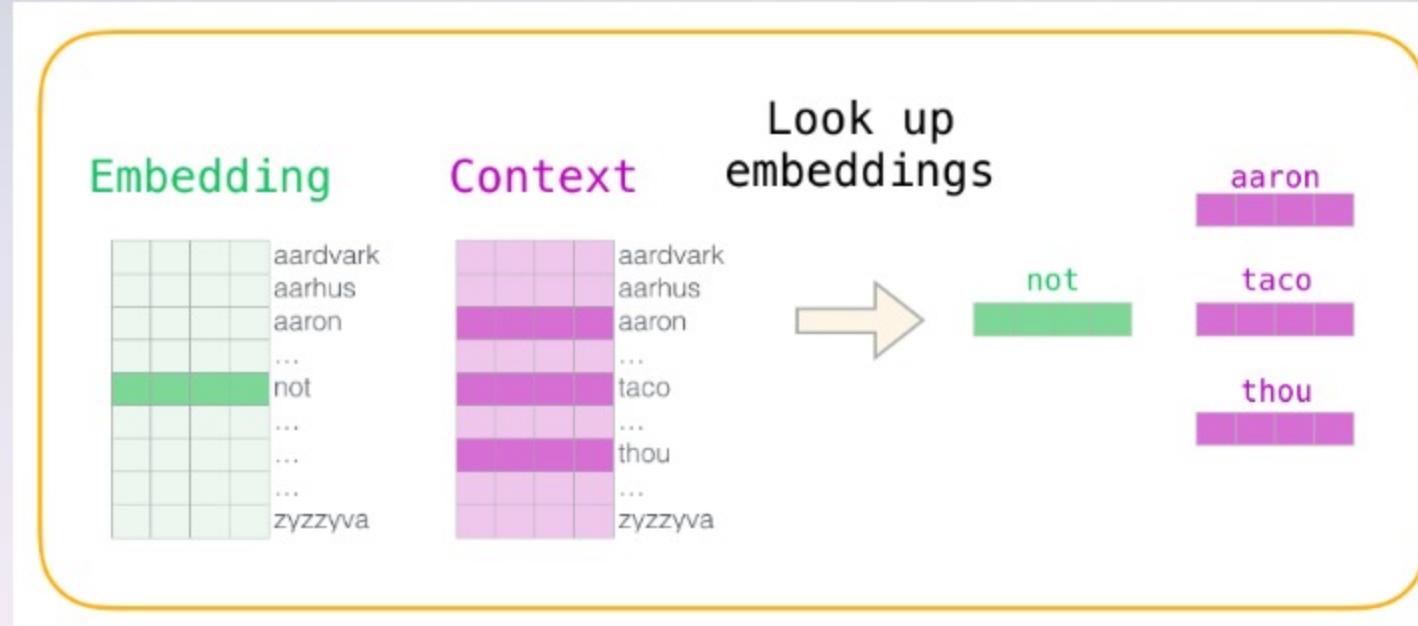


CBOW



Skip-gram





node-word2vec



CODE2VEC

```
void f(int[] array) {
    boolean swapped = true;
    for (int i = 0; i < array.length && swapped; i++) {
        swapped = false;
        for (int j = 0; j < array.length - i - 1; j++) {
            if (array[j] > array[j+1]) {
                int temp = array[j];
                array[j] = array[j+1];
                array[j+1] = temp;
                swapped = true;
            }
        }
    }
}
```

sort | 98.54%

bubbleSort | 0.35%

reverse | 0.25%

reverseArray | 0.23%

heapify | 0.15%

AST

Prediction

- PLAYGROUND
- Most Similar
- Combinations
- Analogies

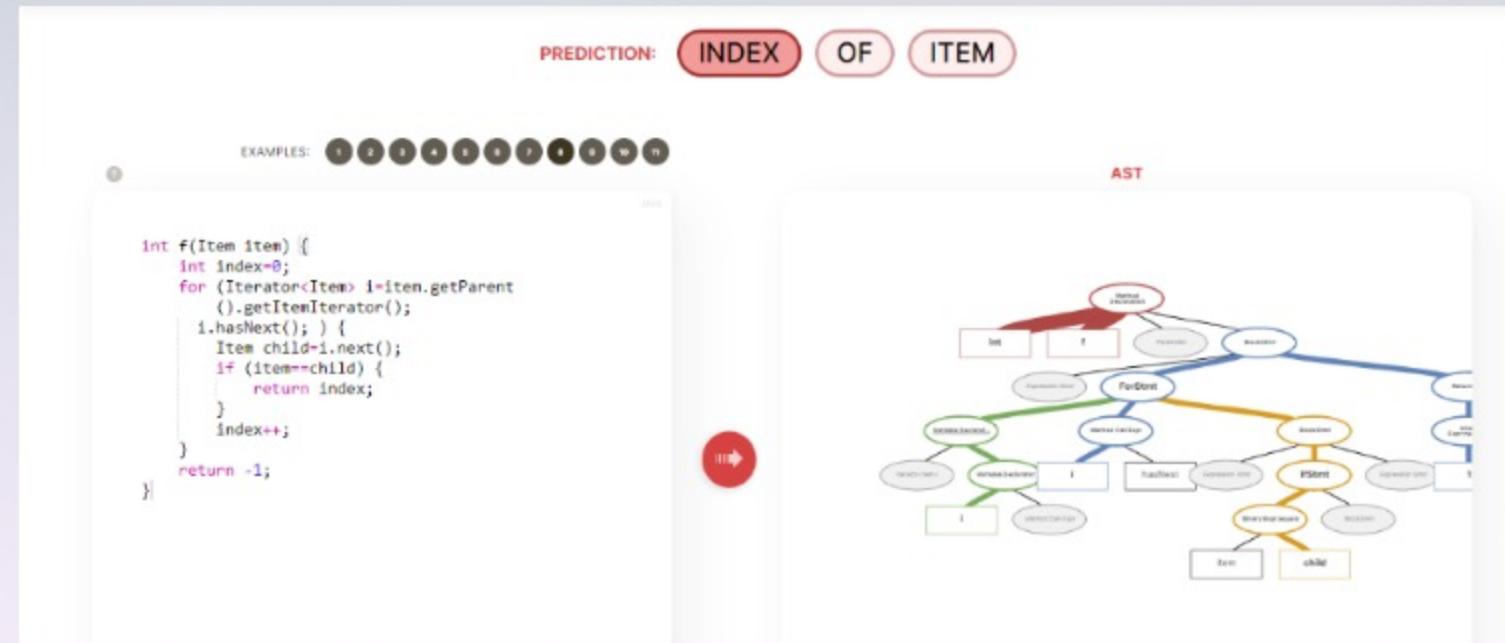
About

Credits

Code2Vec

<https://code2vec.org/>



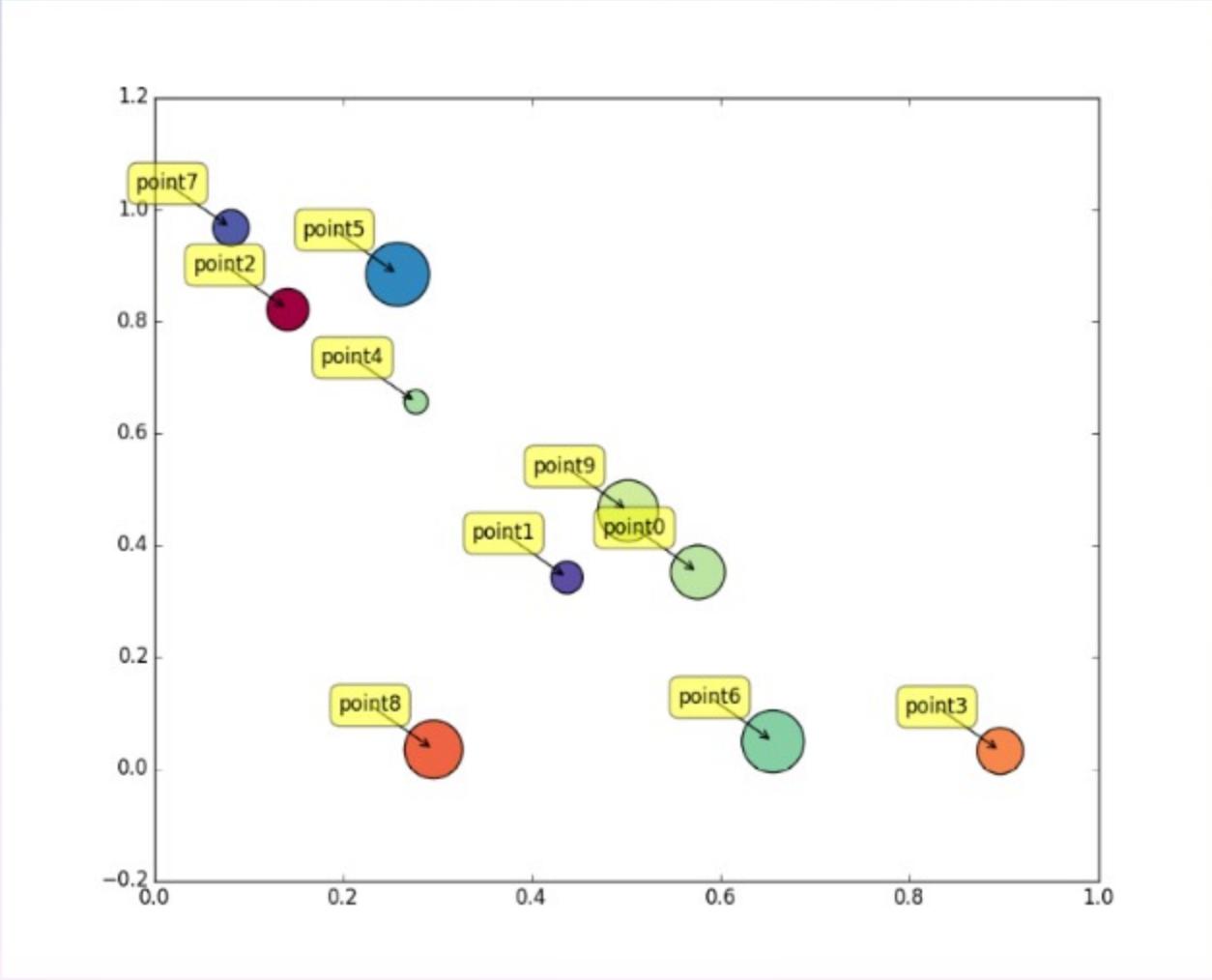


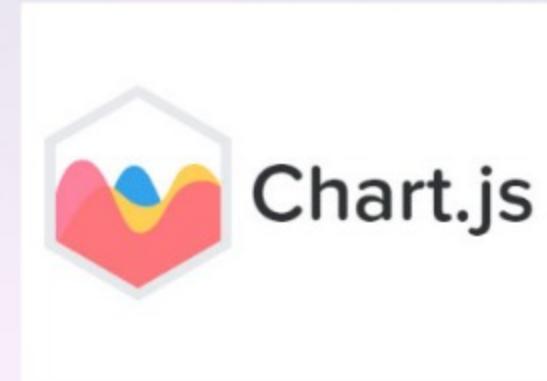
Code2Sec

<https://code2sec.org/>



Статистика по данным





Графики по данным





Примеры

Handtrack.js

A library for prototyping realtime handtracking in the browser. [[Github](#)]

Demo

All detection is done in the browser! Click on an image or Start video

[Stop Video Detection](#)

[Flip Image](#)

Modify confidence score threshold.

0.71

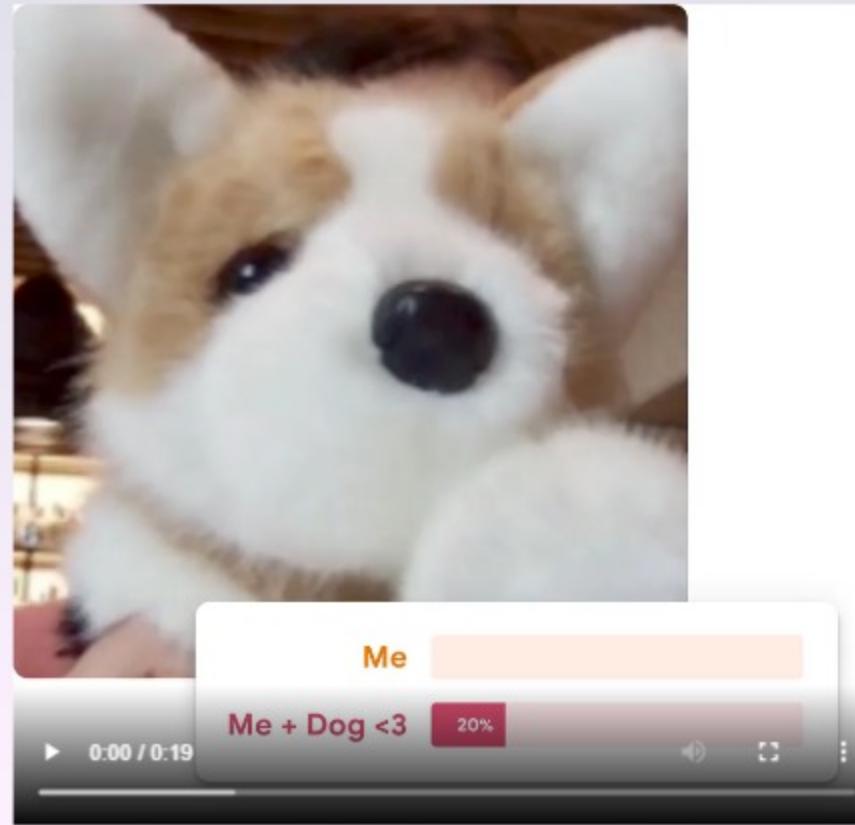
Detection not working as expected? Change the confidence threshold value. The right threshold may depend on your [camera](#) and [lighting](#) conditions.



FPS	Image Size	Device	Browser
21	450 * 380	Macbook Pro (i7, 2.2GHz, 2018)	Chrome Version 72.0.3626
14	450 * 380	Macbook Pro (i7, 2.2GHz, mid 2014)	Chrome Version 72.0.3626

- 783 kb
- При загрузке MobileNetV2 - без тормозов

Teachable Machine



Mortal Combat with movement.js



MLonCode



Наборы данных

- Javascript dataset: <https://www.sri.inf.ethz.ch/js150>
- Javascript dataset: <https://archive.org/details/javascript-sources-oct2016.sqlite30>
- Names in source codes:
<https://data.world/vmarkovtsev/github-source-code-names>
- Models: <https://github.com/src-d/models>
- CodeSearchNet: <https://github.com/github/CodeSearchNet>



Pix2Code

Code2Pix:

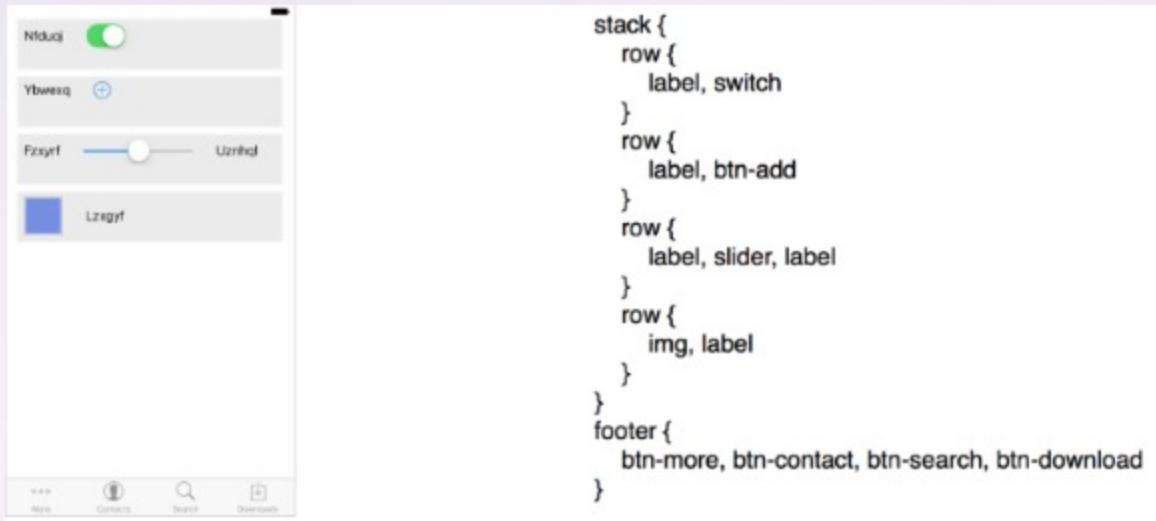
<https://github.com/ngundotra/code2pix>

Pix2Code:

<https://github.com/tonybeltramelli/pix2code>

Company: <https://uizard.io/research/#pix2code>

Arxiv: <https://arxiv.org/abs/1705.07962>



The image shows a mobile application interface on the left and its corresponding CSS code on the right. The application interface includes several UI elements: a switch labeled 'Ntduoi' with a green toggle, a button labeled 'Ybwexq' with a plus sign, a slider with a blue track and a white handle, and a button labeled 'Lzegyf'. At the bottom, there is a navigation bar with icons for Home, Contacts, Search, and Downloads. The CSS code on the right defines styles for these elements:

```
stack {  
    row {  
        label, switch  
    }  
    row {  
        label, btn-add  
    }  
    row {  
        label, slider, label  
    }  
    row {  
        img, label  
    }  
}  
footer {  
    btn-more, btn-contact, btn-search, btn-download  
}
```



Getafix - facebook fix manager

Ссылка: <https://arxiv.org/pdf/1902.06111.pdf>

```
20     public boolean onBackPressed() {
21         ActivityContext ctx = this.getContext();
22         return ctx.onBackPressed();
```

 phabricatorlinter suggested changes to line 22
The value of `ctx` in the call to `onBackPressed()` could be null. (Origin: call to `getContext()` at line 21).

Questions about this suggested fix? Post in Getafix Feedback

Lint code: INFER

Lint name: Null Method Call

```
+     if (ctx == null) {
+         return false;
+     }
+     return ctx.onBackPressed();
```

10 minutes ago • Like • Reply • Resolve

Accept • Reject

```
23 }
24 }
```



Sapienz - facebook search test suites

Ссылка: <https://arxiv.org/pdf/1811.04122.pdf>

http://www0.cs.ucl.ac.uk/staff/K.Mao/archive/p_issta16_sapienz.pdf



Aroma

Ссылка: <https://ai.facebook.com/blog/aroma-ml-for-code-recommendation/>

The screenshot shows a dark-themed interface for Aroma, a tool for code recommendation. It displays two code snippets side-by-side:

```
3  
4  
5 import android.graphics.Bitmap;  
6  
7 public class Demo {  
8  
9     public static void demo() {  
10         InputStream input = manager.open(file);  
11         Bitmap bitmap = BitmapFactory.decodeStream(input);  
12     }  
13 }  
14
```



```
2     Bitmap image = null;  
3     // ...  
4     try  
5     {  
6         InputStream is = am.open(fileName);  
7         image = BitmapFactory.decodeStream(is);  
8         is.close();  
9     }  
10    catch (IOException e)  
11    {  
12        e.printStackTrace();  
13    }  
14    // ...  
15 }
```

Below the code, a message indicates it was "CLUSTERED FROM 6 METHODS". A tooltip provides a link to "https://github.com/facebook/aroma#method-clustering". At the bottom, a list of source code locations is shown:

- > yuyuyu123/zCommon/zcommon/src/main/java/com/cc/android/zcommon/utils/android/AssetUtils.java:30
- > u014427391/elemeimitate/MealOrderSystemClient/src/com/mos/utils/Tools.java:153
- > h0ngyue/AndroidLiveSDK/sdk/src/main/java/com/yolo/beautycamera/beauty_preview/utils/OpenGlUtils.java:174



Naturalize

Repo: <https://github.com/mast-group/naturalize>

More description names

```
computed: {
  prop1() {
    return this.isPaid.length == 0;
  },
  prop2() {
    return this.isPaid.length > 0;
  }
},
methods: {
  method3() {
    var that = this;
    requests.createMessage(this.createUrl, this.userId, this.text, function () {
      that.$emit('close');
    });
  }
}
```



Naturalize

Repo: <https://github.com/mast-group/naturalize>

More description names

```
computed: {
  isNotPaid() {
    return this.isPaid.length == 0;
  },
  isPaided() {
    return this.isPaid.length > 0;
  }
},
methods: {
  sendMessage() {
    var that = this;
    requests.createMessage(this.createUrl, this.userId, this.text, function () {
      that.$emit('close');
    });
  }
}
```



Typilus

Repo: <https://github.com/typilus/typilus-action>
Action names for python

```
@@ -1,5 +1,5 @@
 class Checker {
-  setButton(buttonValue) {
    this.buttonCounter = buttonValue
  }
+}

 1  class Checker {
 2  +  setButton(buttonValue: int) {
 3    this.buttonCounter = buttonValue
 4  }
 5

 class Checker {
  setButton(buttonValue) {
    this.buttonCounter = buttonValue
  }

  increaseButtonCounter() {
    this.buttonCounter++;
  }
}
```



Aicodoo

Repo: <http://aicodoo.com/>

Generate code (Rest api), Java

```
public Innovation start() {  
    Innovation aicodoo = AI.writes(code);  
    Productivity.boost();  
    "Try it yourself on aicodoo.com!".equals("Impressive!");  
    return aicodoo;  
}
```



Workshop

Notebooks:

Name suggestion

[https://github.com/mloncode/workshop/blob/master/notebooks/Name suggestion.ipynb](https://github.com/mloncode/workshop/blob/master/notebooks/Name%20suggestion.ipynb)

Similarities

[https://github.com/mloncode/workshop/blob/master/notebooks/Project and Developer Similarity.ipynb](https://github.com/mloncode/workshop/blob/master/notebooks/Project%20and%20Developer%20Similarity.ipynb)

DevFest2019

<https://github.com/mloncode/devfest2019-workshop>



Q&A

MLonCode

Vadim Markovtsev

source{d}

Tiferet Gazit

BecomingHuman

@alexanderksen1

code defect ai from Microsoft

@miltos1

ai.facebook

@headinthebox

go-bully

@francesc

ibm/clai

@cloudkserg

