# Многоликий Machine Learning

Роман Неволин, EPAM

machine learning
Поисковый запрос

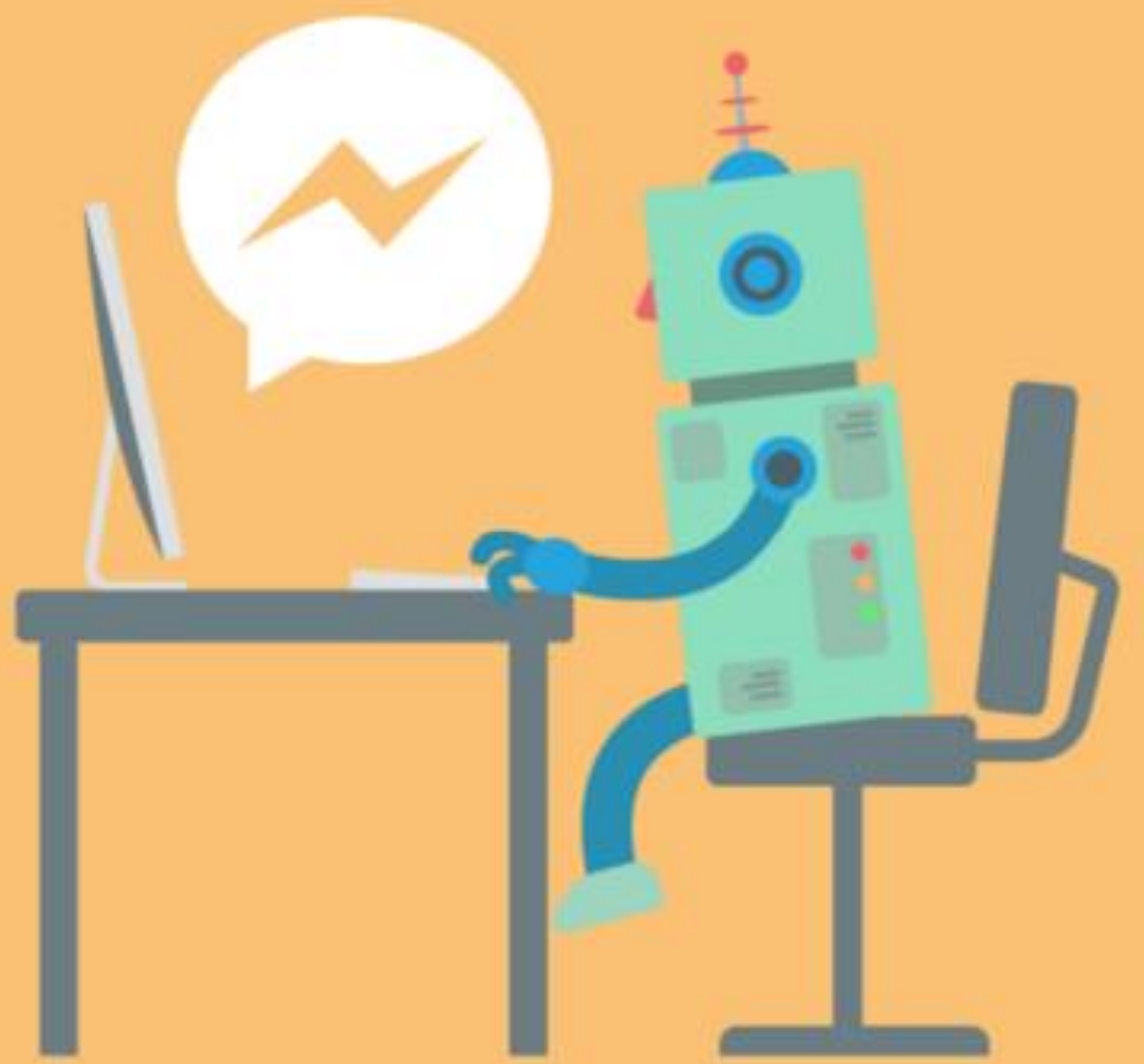
+ Сравнить

По всему миру | 2004 – настоящее время | Все категории | Веб-поиск

Динамика популярности

Многие проблемы в современном программировании решаются машинным обучением


Auto
Options



## Machine Learning is Fun! – Adam Geitgey – Medium

https://medium.com/.../machine-learning-is-fun-80ea3ec3c4... ▾ Перевести эту страницу

5 мая 2014 г. - What **is machine learning**? **Machine learning is** the idea that there are generic algorithms that can tell you something **interesting** about a set of data without you having to write any custom code specific to the problem. Instead of writing code, you feed data to the generic algorithm and it builds its own logic ...

## Machine Learning is Fun! – Adam Geitgey – Medium

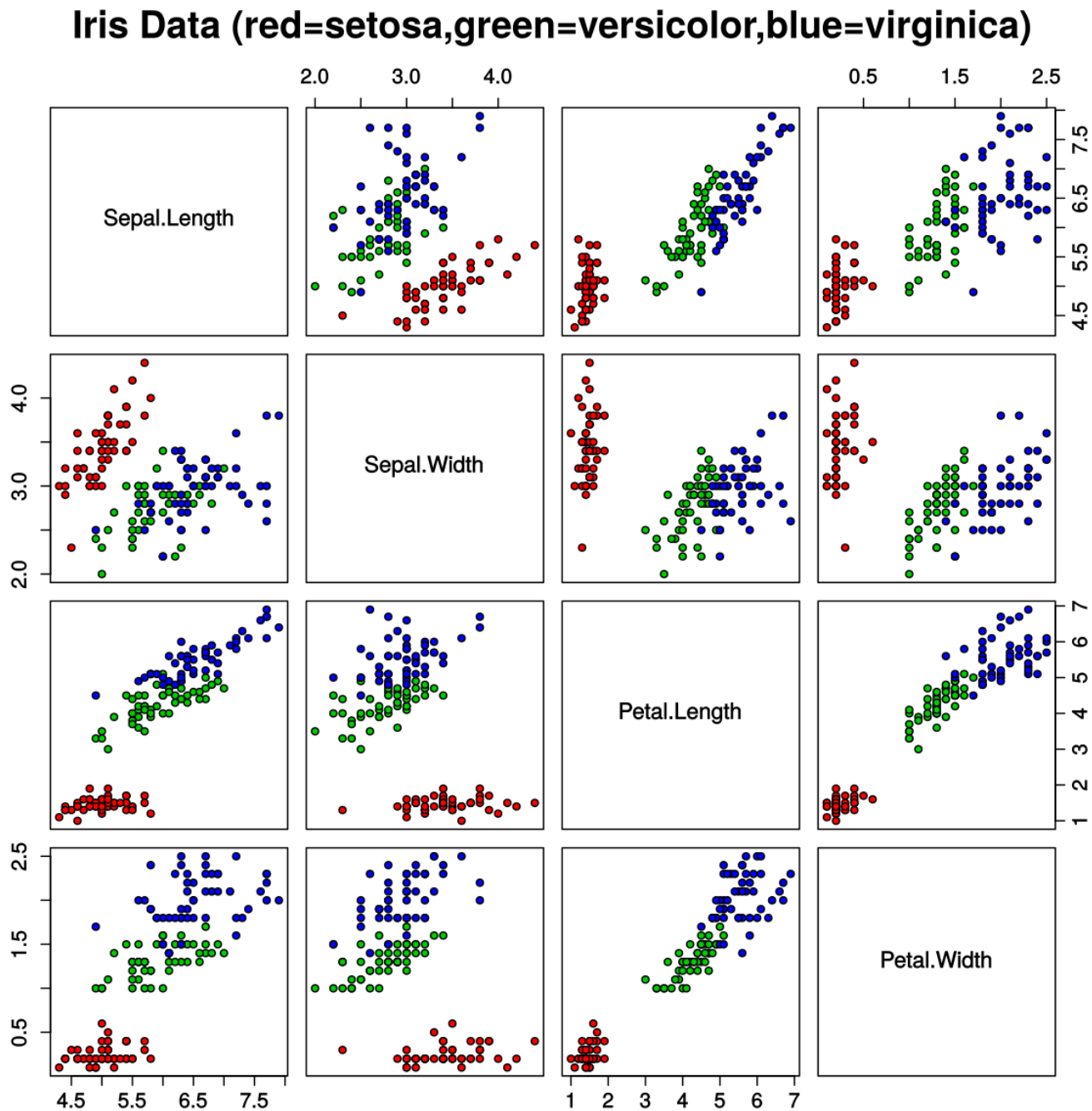
https://medium.com/.../machine-learning-is-fun-80ea3ec3c4... ▾ Перевести эту страницу

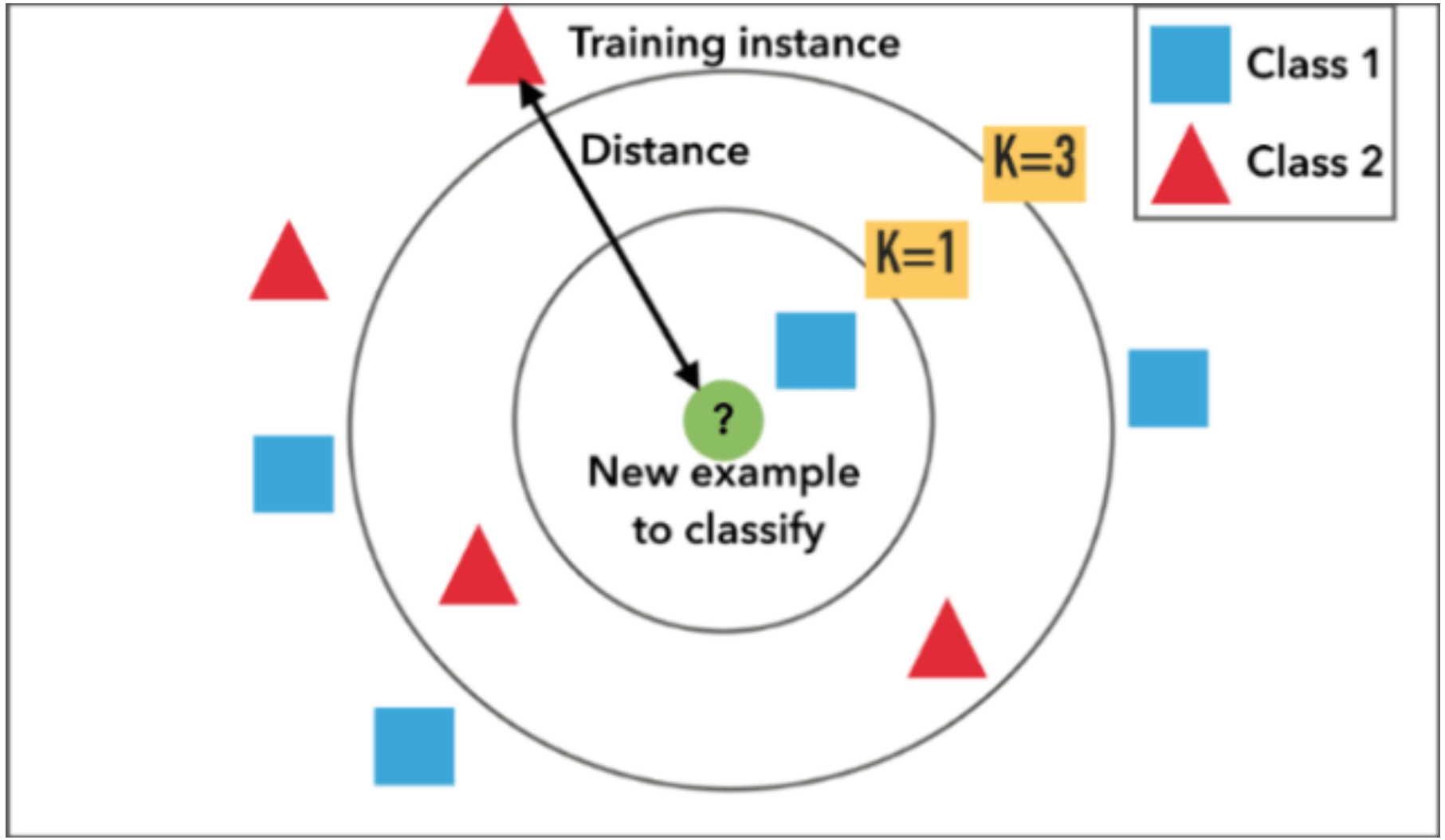
5 мая 2014 г. - What **is machine learning**? **Machine learning is** the idea that there are generic algorithms that can tell you something **interesting** about a set of data without you having to write any custom code specific to the problem. Instead of writing code, you feed data to the generic algorithm and it builds its own logic ...

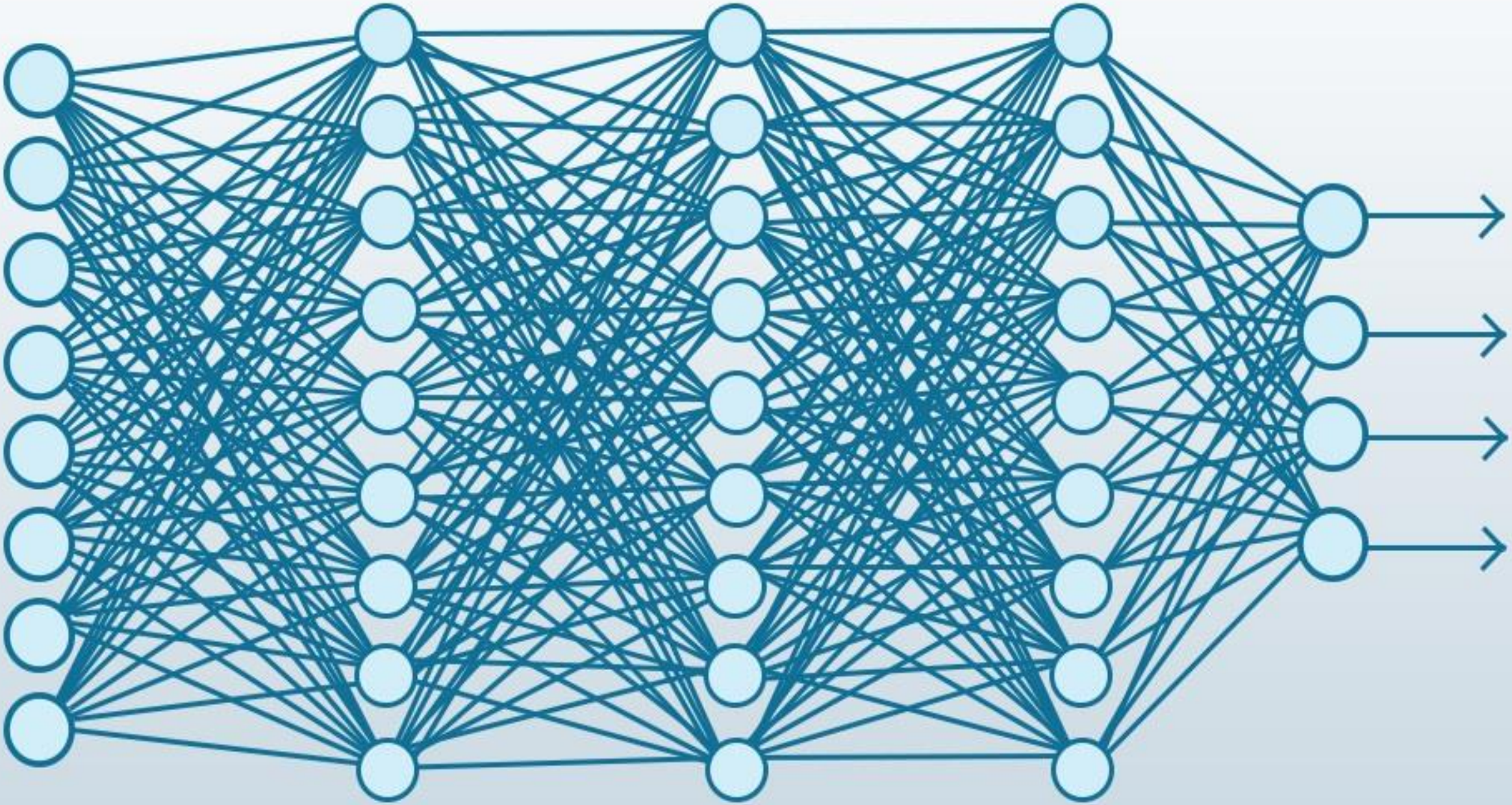
## Machine learning is way easier than it looks | Inside Intercom

https://blog.intercom.com/machine-learning-way-easier-than... ▾ Перевести эту страницу

It's **easy** to believe that **machine learning** is hard. An arcane craft known only to a select few academics. After all, you're teaching machines that work in ones and zeros to reach their own conclusions about the world. You're teaching them how to think! However, it's not nearly as hard as the complex and formula-laden ...


Iris Data (red=setosa,green=versicolor,blue=virginica)
Sepal.Length
Sepal.Width
Petal.Length
Petal.Width
2.0
3.0
4.0
0.5
1.5
2.5
4.5
5.5
6.5
7.5
1
2
3
4
5
6
7


Training instance
Distance
K=3
K=1
?
New example
to classify
Class 1
Class 2



$$C(w,b) \equiv \frac{1}{2n} \sum_x \|y(x) - a\|^2.$$

$$C(w,b) \equiv \frac{1}{2n} \sum_x \|y(x) - a\|^2.$$

$$R[f] \leq \hat{R}_{\text{val}}[f] + \frac{2C \ln(\frac{|F_{\text{val}}|}{\delta})}{3m_{\text{val}}} + \sqrt{\frac{2\gamma^2 \ln(\frac{|F_{\text{val}}|}{\delta})}{m_{\text{val}}}}.$$

$$C(w,b) \equiv \frac{1}{2n} \sum_x \|y(x) - a\|^2.$$

$$R[f] \leq \hat{R}_{\text{val}}[f] + \frac{2C \ln(\frac{|F_{\text{val}}|}{\delta})}{3m_{\text{val}}} + \sqrt{\frac{2\gamma^2 \ln(\frac{|F_{\text{val}}|}{\delta})}{m_{\text{val}}}}.$$

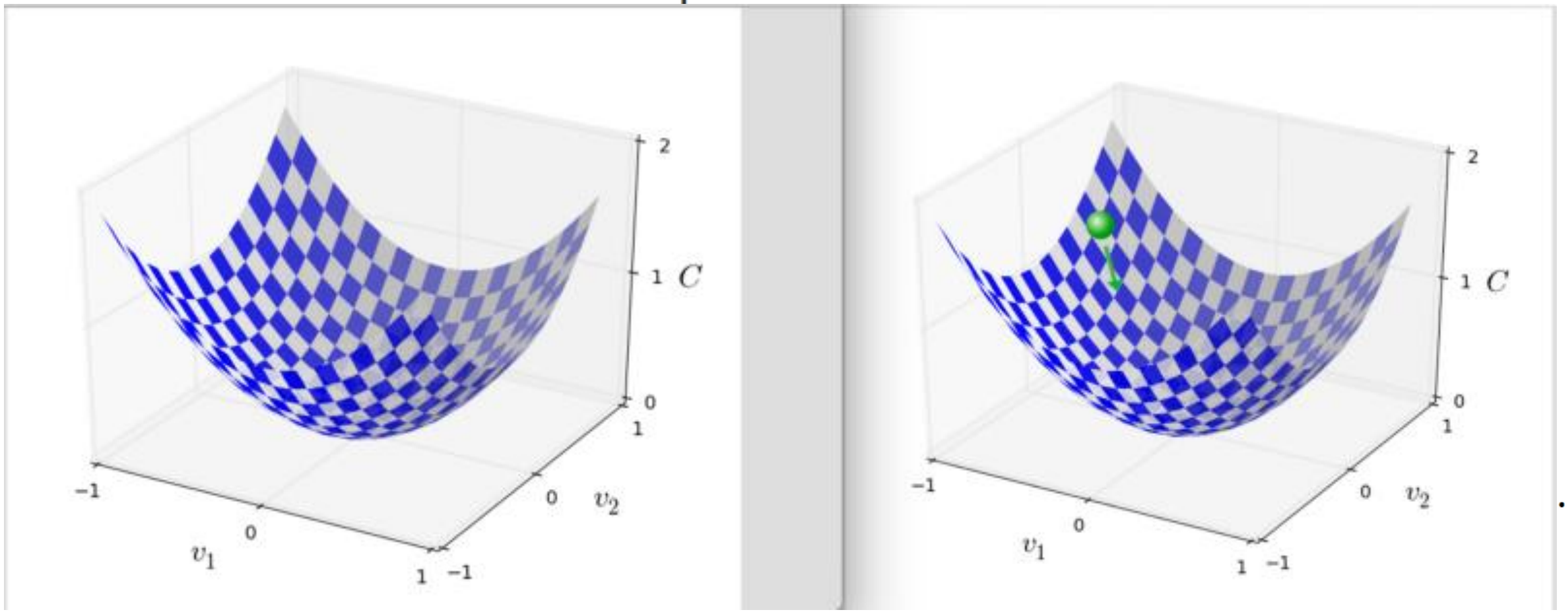
$$\mathop{\mathbb{E}}_{S,A}\left[R(A_S) - \widehat{R}_S(A_S)\right] \leqslant \mathcal{O}\left(\frac{1+\frac{1}{c\gamma}}{m} \cdot \max\left\{\left(\mathop{\mathbb{E}}_{S,A}\left[\widehat{R}_S(A_S)\right] \cdot T\right)^{\frac{c\gamma}{1+c\gamma}}, \left(\frac{T}{m}\right)^{c\gamma}\right\}\right).$$

$$C(w,b) \equiv \frac{1}{2n} \sum_x \|y(x) - a\|^2.$$

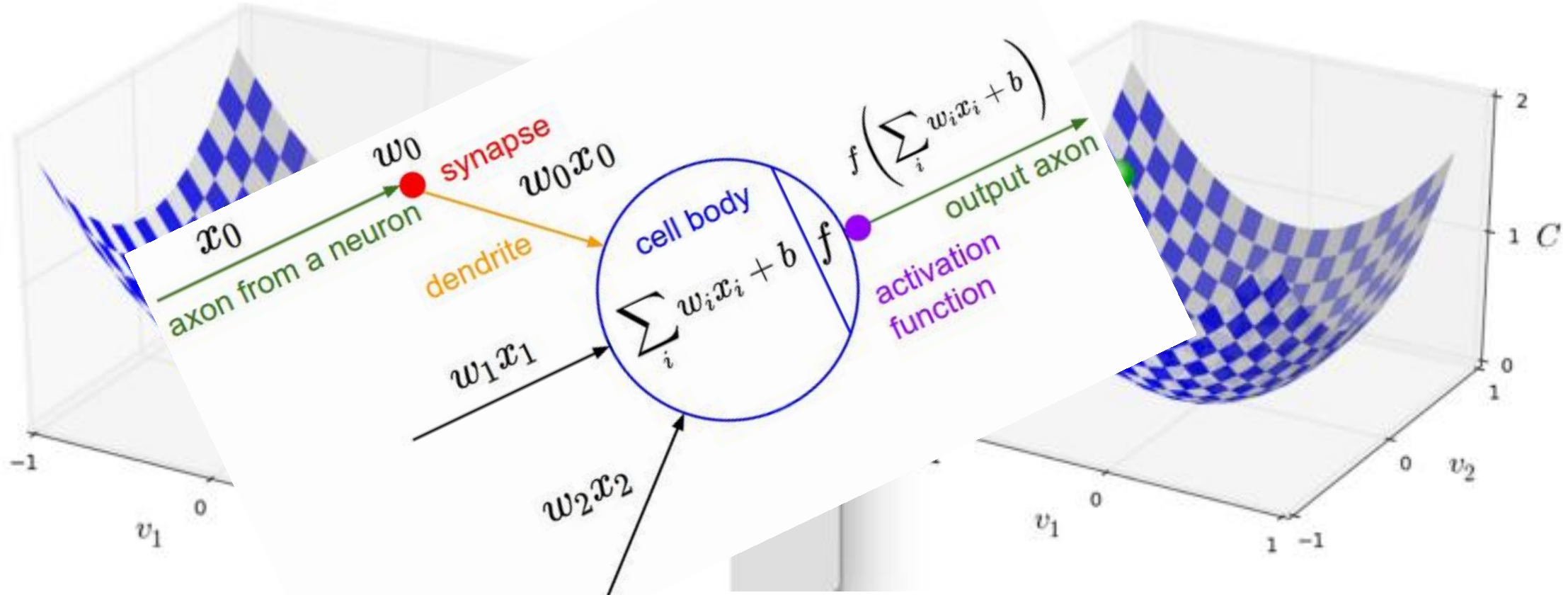
$$R[f] \leq \hat{R}_{\text{val}}[f] + \frac{2C \ln(\frac{|F_{\text{val}}|}{\delta})}{3m_{\text{val}}} + \sqrt{\frac{2\gamma^2 \ln(\frac{|F_{\text{val}}|}{\delta})}{m_{\text{val}}}}.$$

$$\mathop{\mathbb{E}}_{S,A}\left[R(A_S) - \widehat{R}_S(A_S)\right] \leqslant \mathcal{O}\left(\frac{1+\frac{1}{c\gamma}}{m} \cdot \max\left\{\left(\mathop{\mathbb{E}}_{S,A}\left[\widehat{R}_S(A_S)\right] \cdot T\right)^{\frac{c\gamma}{1+c\gamma}}, \left(\frac{T}{m}\right)^{c\gamma}\right\}\right).$$

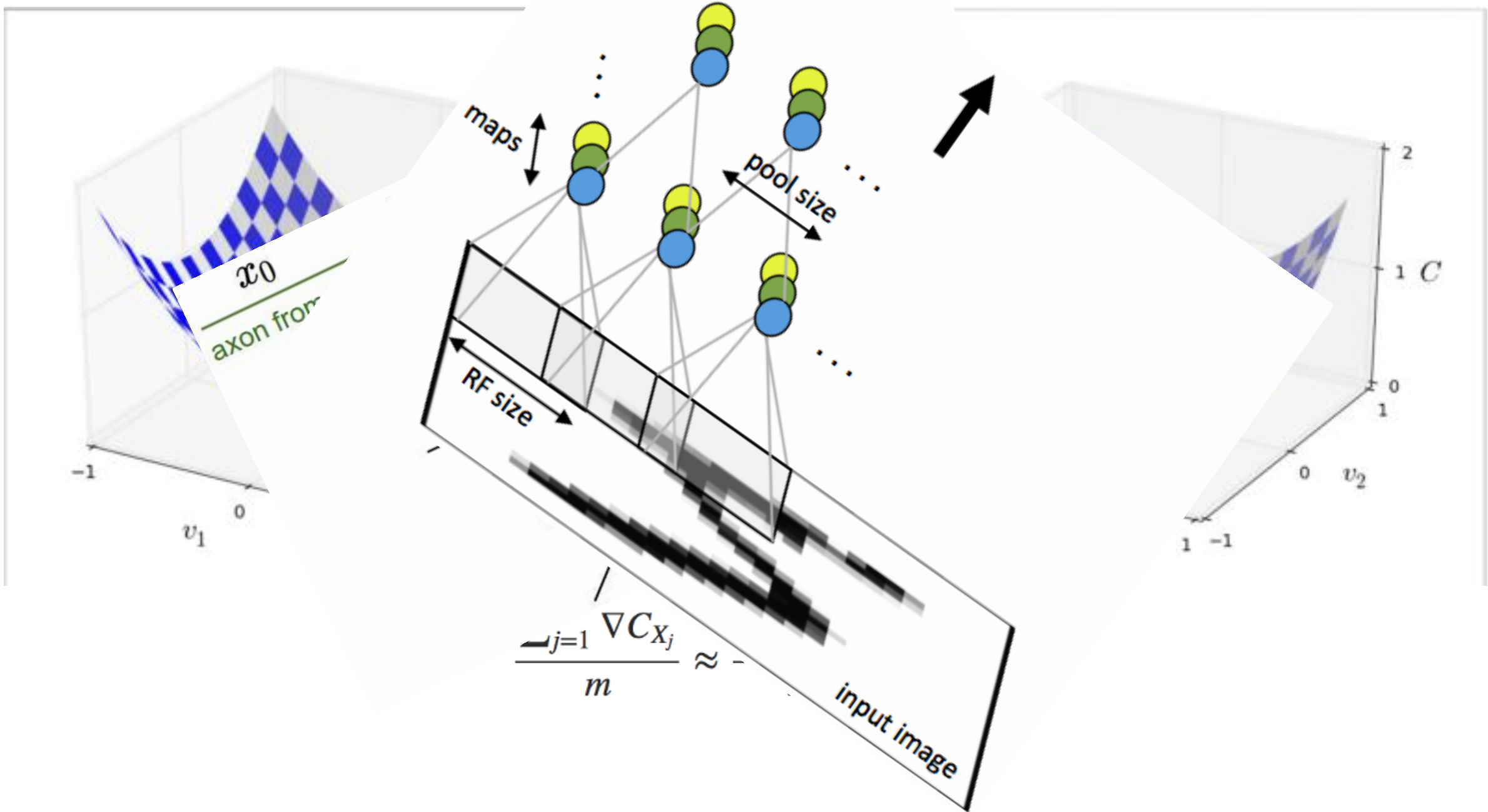
$$\frac{\sum_{j=1}^m \nabla C_{X_j}}{m} \approx \frac{\sum_x \nabla C_x}{n} = \nabla C,$$

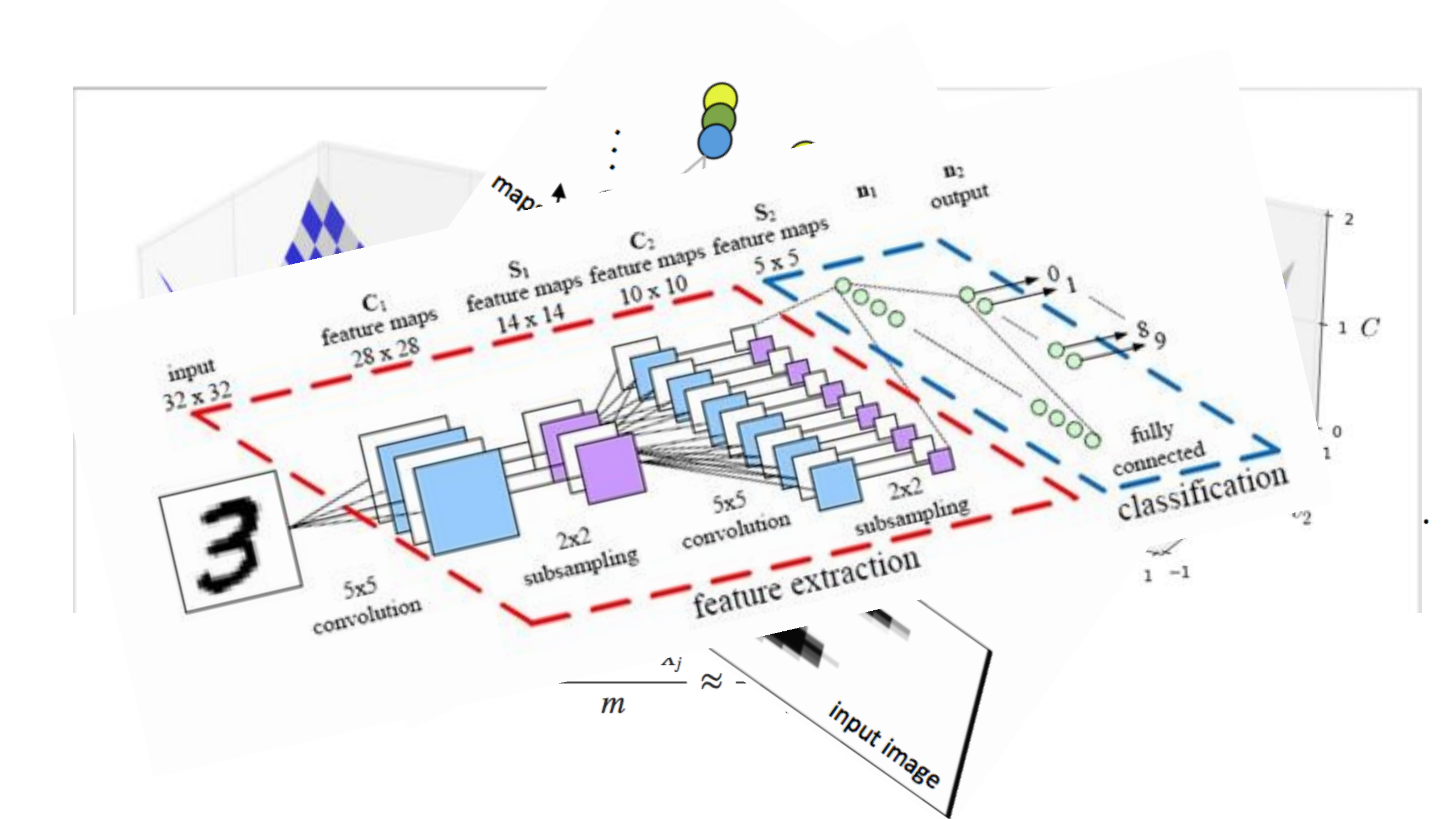



$$\frac{\sum_{j=1}^{m} \nabla C_{X_j}}{m} \approx \frac{\sum_x \nabla C_x}{n} = \nabla C,$$



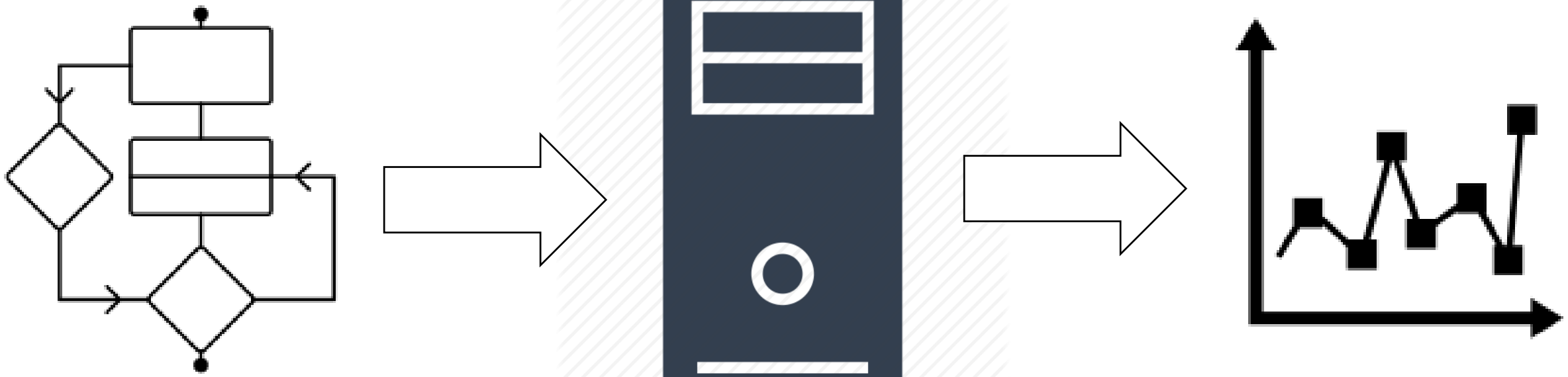

$$\frac{\sum_{j=1} \nabla C_{X_j}}{m} \approx \frac{\sum_x \nabla C_x}{n} = \nabla C,$$


$x_0$
axon from
−1
0
$v_1$
maps
pool size
RF size
input image
$\frac{\sum_{j=1} \nabla C_{X_j}}{m} \approx$
2
1
$C$
0
1
0
$v_2$
1
−1

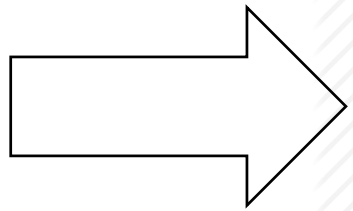

input
32 x 32
C1
feature maps
28 x 28
S1
feature maps
14 x 14
C2
feature maps
10 x 10
S2
feature maps
5 x 5
n1
n2
output
5x5
convolution
2x2
subsampling
5x5
convolution
2x2
subsampling
fully
connected
feature extraction
classification
input image

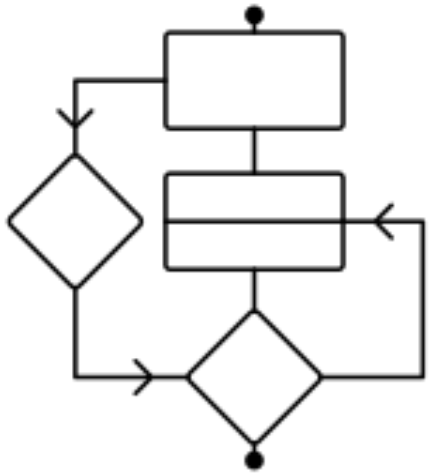
СТОП! Я просто хотел распознать изображение, неужели это так сложно?

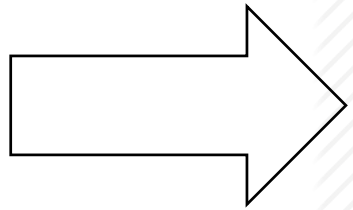
# Что такое машинное обучение?

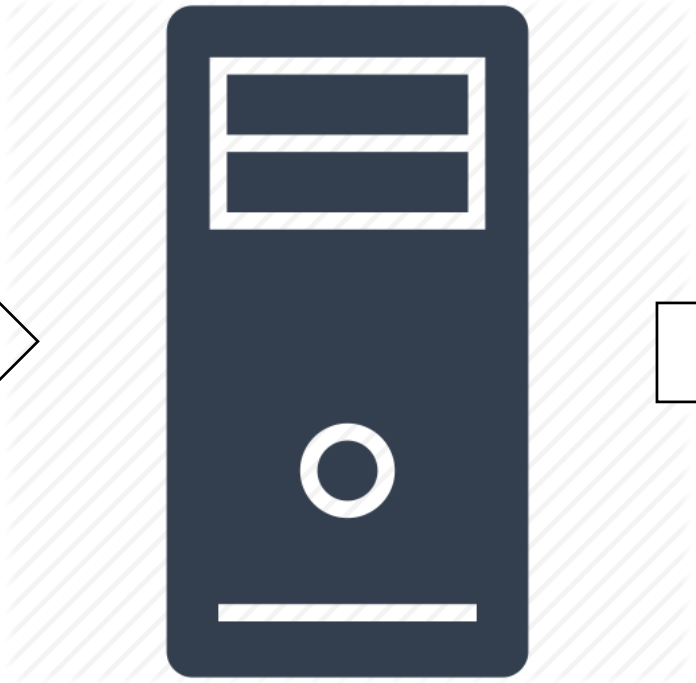


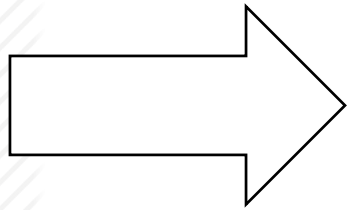
А что если у нас нет алгоритма и мы не знаем, как решить задачу?

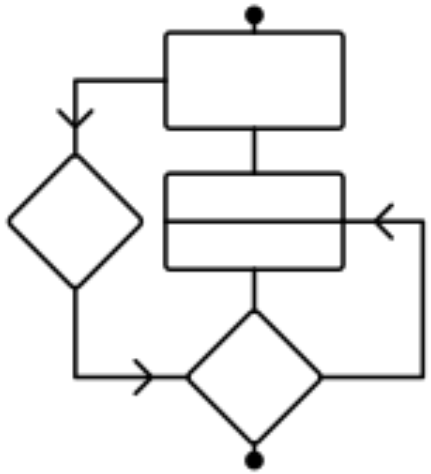












«Коала»


HBO

# Not Hotdog 12+

SeeFood Technologies Inc.

★★★★½ 535 Ratings

Free

## Screenshots iPhone iPad


# Стоит помнить, что:

- Для обучения модели нам нужно много размеченных данных.

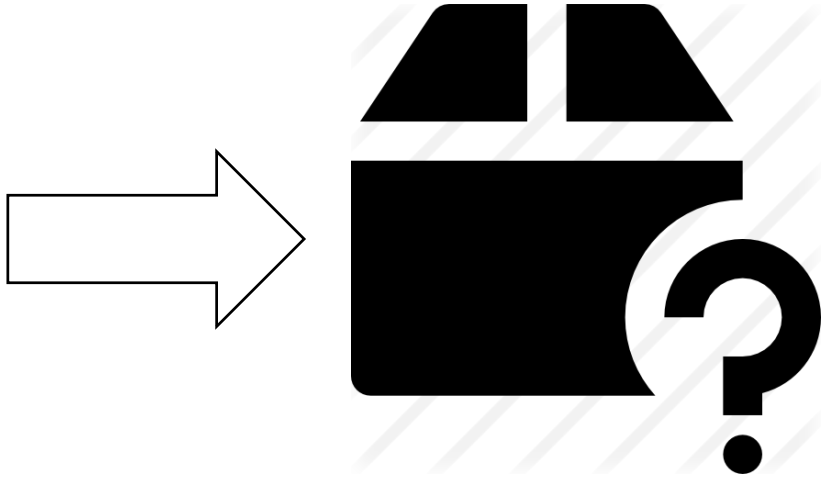
# Стоит помнить, что:

- Для обучения модели нам нужно много размеченных данных.
- Алгоритм машинного обучения всегда дает результат с некоторой степенью точности.

# Стоит помнить, что:

- Для обучения модели нам нужно много размеченных данных.
- Алгоритм машинного обучения всегда дает результат с некоторой степенью точности.
- Обучать модель – сложно и ресурсозатратно.

«Коала»

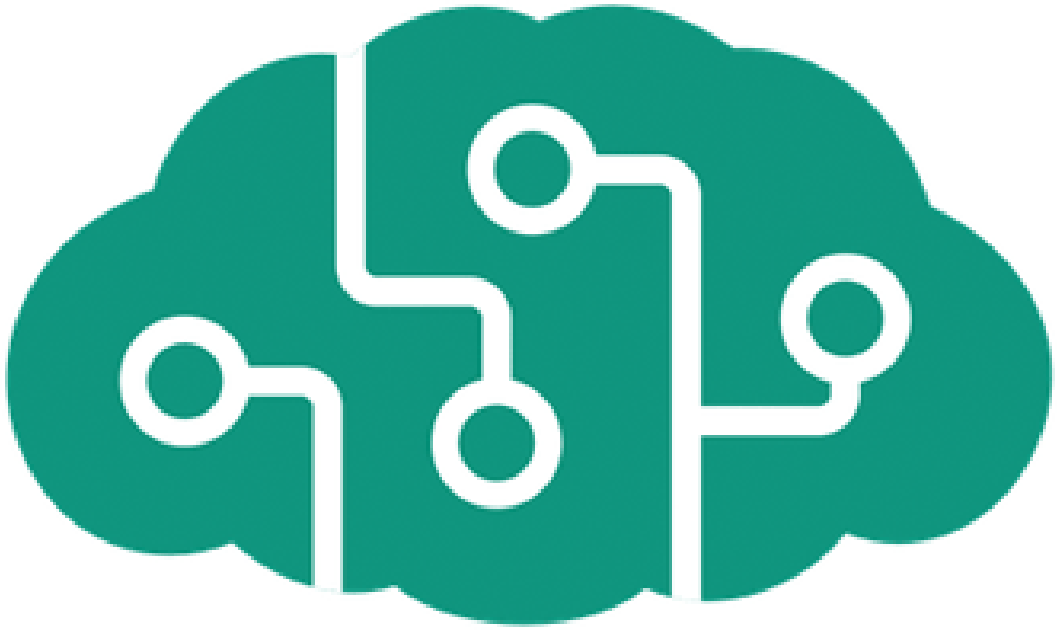


«Коала»

«NotHotdog»

«Коала»





Microsoft

# Cognitive Services

| НАЗВАНИЕ ФУНКЦИИ: | ЗНАЧЕНИЕ |
| --- | --- |
| Описание | { "tags": [ "ceiling", "indoor", "person", "large", "building", "auditorium", "filled", "room", "computer", "laptop", "standing", "people", "sitting", "man", "group", "table", "lot", "woman", "crowd", "black", "screen", "court", "many", "player", "white", "blue", "ball", "game", "playing" ], "captions": [ { "text": "a large crowd of people in a room", "confidence": 0.968449652 } ] } |

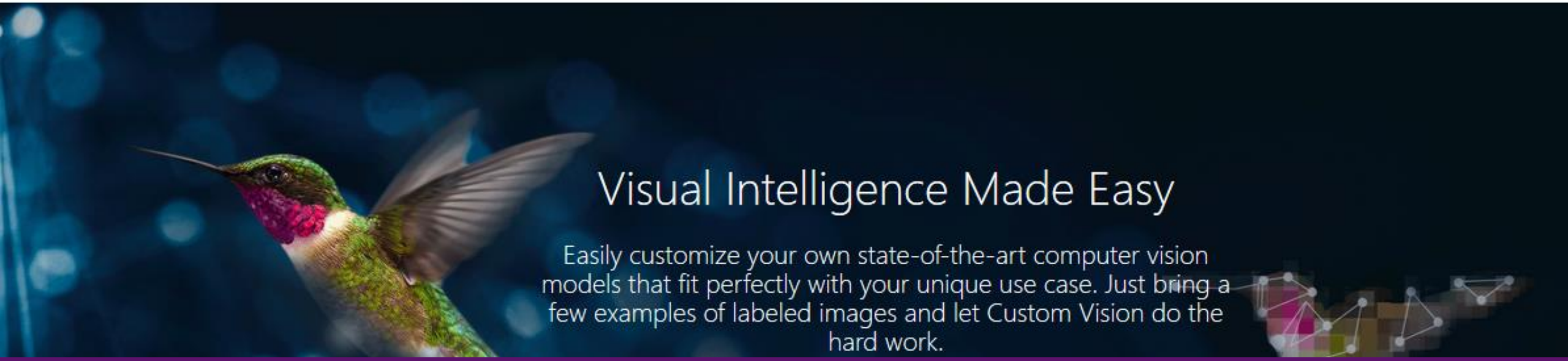
"captions": [ { "text": "a large crowd of people in a room", "confidence": 0.968449652 } ] }

https://www.microsoft.com/cognitive-services

# В чем выгода использования API?

- Все преимущества облака
- Независимость от набора данных
- Простота использования

Microsoft | Cognitive Services | Custom Vision



# Visual Intelligence Made Easy

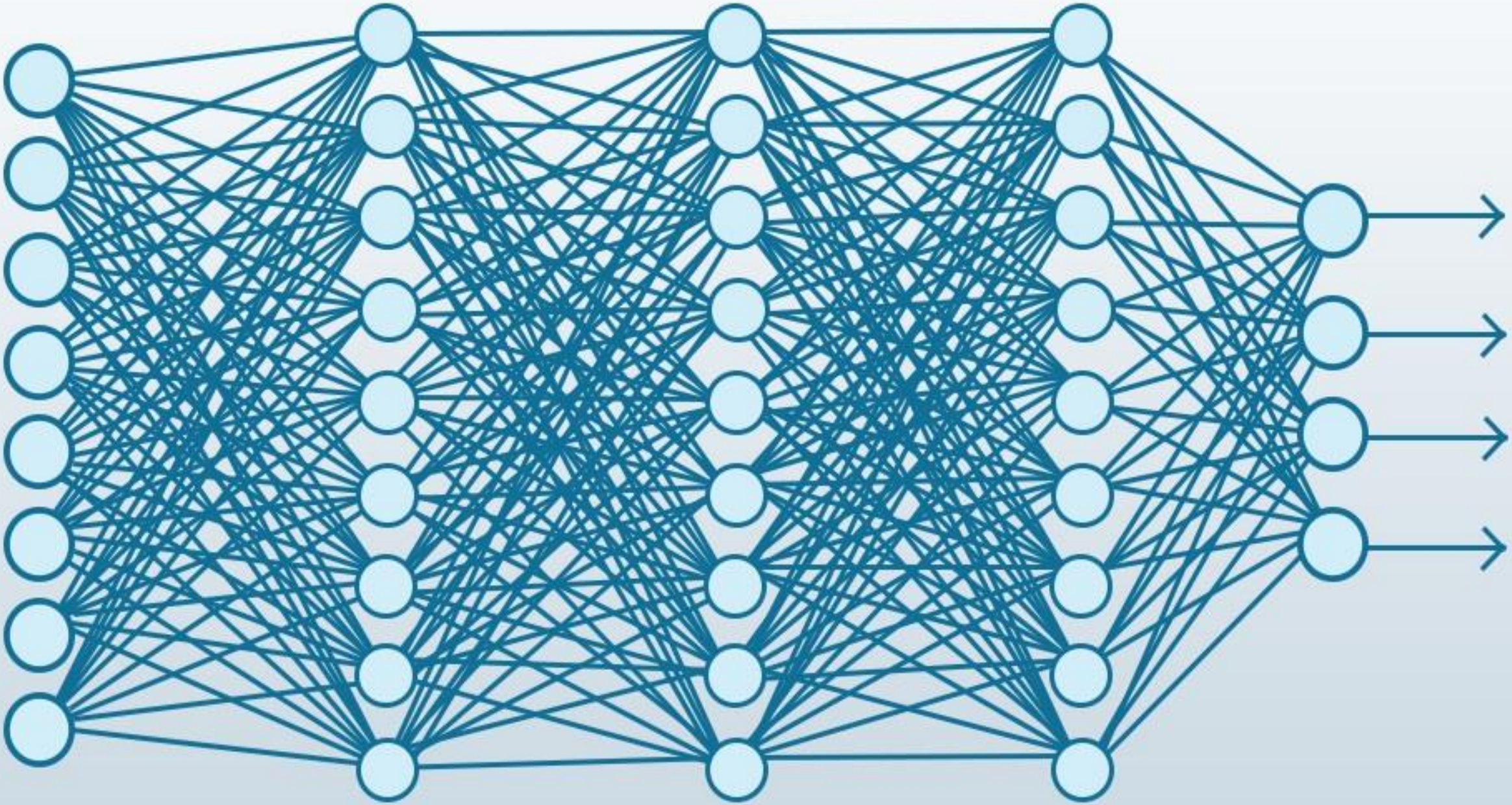
Easily customize your own state-of-the-art computer vision models that fit perfectly with your unique use case. Just bring a few examples of labeled images and let Custom Vision do the hard work.

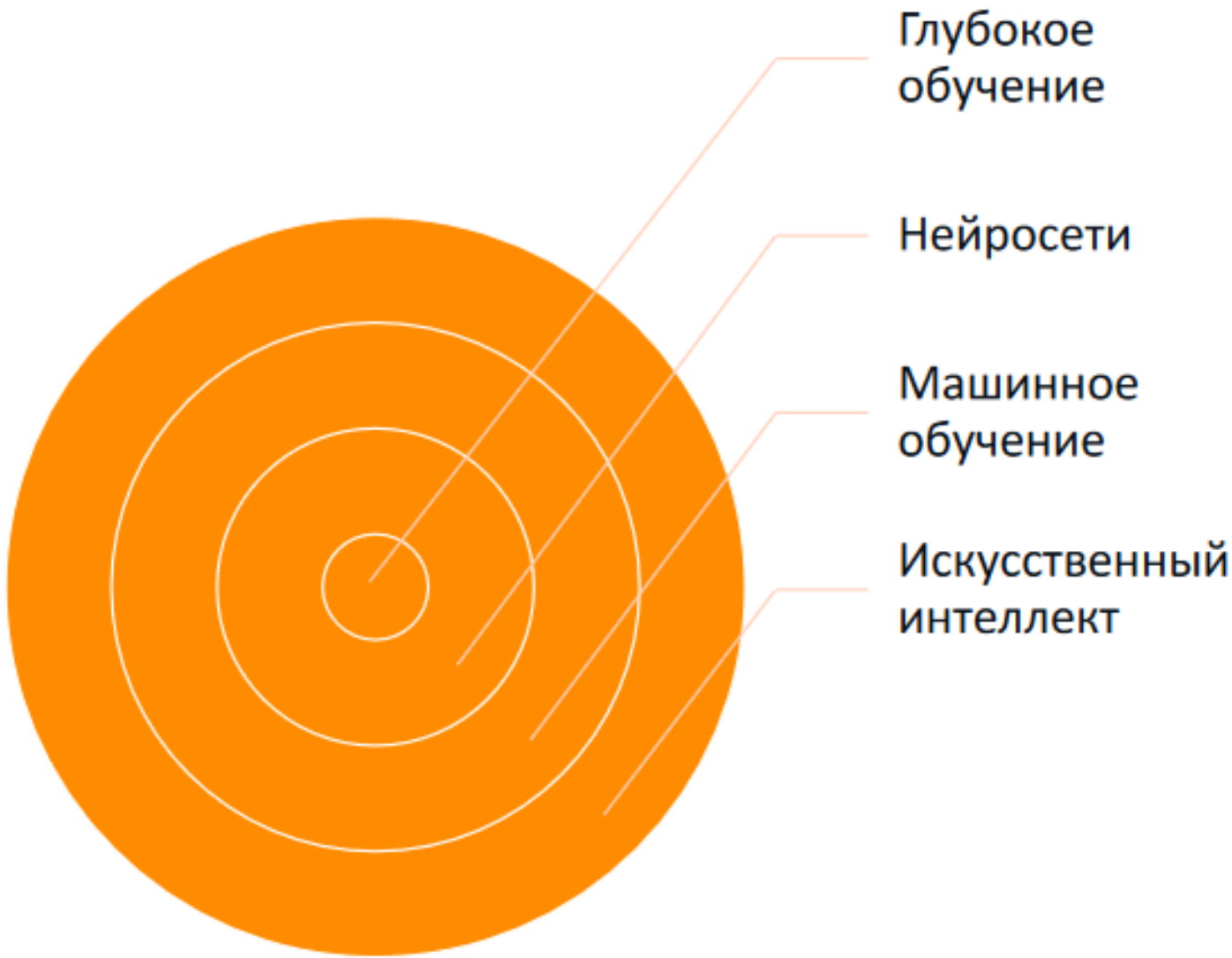
# Language Understanding (LUIS)

A machine learning-based service to build natural language into apps, bots, and IoT devices. Quickly create enterprise-ready, custom models that continuously improve.


Login / Sign up

# Демо: Cognitive Services




Глубокое обучение
Нейросети
Машинное обучение
Искусственный интеллект


Microsoft
Cognitive
Toolkit
aka.ms/CognitiveToolkit
Microsoft

## CSharp basic API with examples and tests

Browse files

master (#8) v2.4 ... v2.2

 **liqunfu** committed on Aug 14, 2017

1 parent 4f5cf2a commit 6bd3892472512e4ad85ddddf0cf2256dc358e7c4

## Add C# training API second commit plus Mark Hillebrand's fix to TestD...

Browse files

…river.py

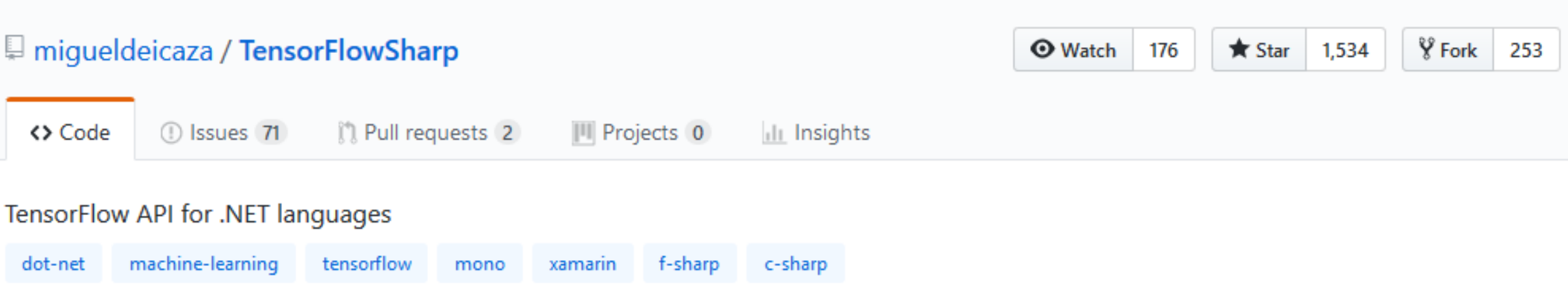
master (#1) v2.4 ... v2.2

 **liqunfu** committed on Sep 3, 2017

1 parent 49cbd85 commit ea788c8574c5e9f698d8782d84de61369734b55c

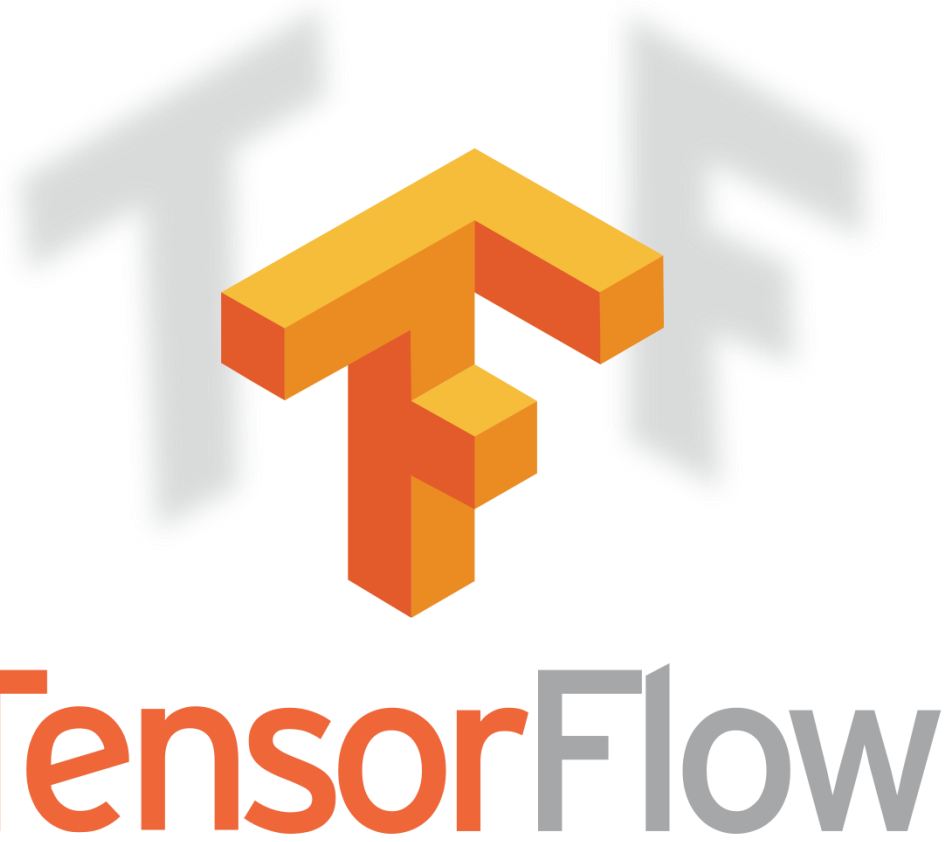
TensorFlow


mono




https://github.com/migueldeicaza/TensorFlowSharp


Microsoft
Cognitive
Toolkit
aka.ms/CognitiveToolkit
Microsoft


TensorFlow

tensorflow / **models**

Watch 2,092 | Star 30,691 | Fork 16,932

Code | Issues 486 | Pull requests 190 | Projects 2 | Wiki | Insights

Models and examples built with TensorFlow

1,946 commits | 18 branches | 2 releases | 325 contributors | Apache-2.0

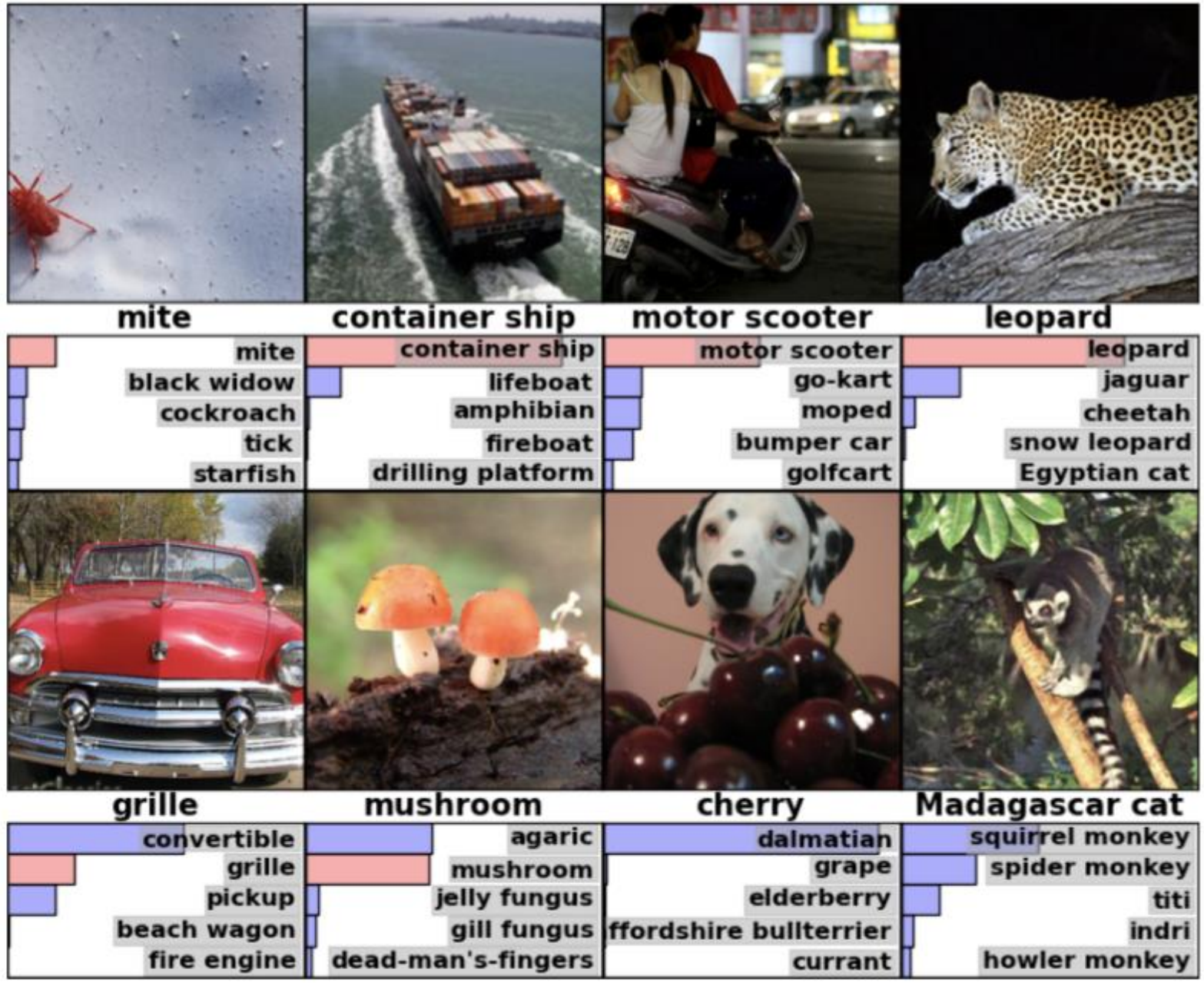
Branch: master | New pull request | Find file | Clone or download

**derekjchow** Merge pull request #3623 from pkulzc/master ... Latest commit f028970 13 hours ago

| | | |
|---|---|---|
| official | partition code between resnet_run_loop and resnet_model (#3621) | 17 hours ago |
| research | space removed | 19 hours ago |
| samples | Merge pull request #3561 from kopankom/fix/assigment-in-loop | 5 days ago |
| tutorials | replace `FLAGS.batch_size` by `images.get_shape()[0]` | 3 days ago |

https://github.com/tensorflow/models

# ImageNet


mite
container ship
motor scooter
leopard
mite
black widow
cockroach
tick
starfish
container ship
lifeboat
amphibian
fireboat
drilling platform
motor scooter
go-kart
moped
bumper car
golfcart
leopard
jaguar
cheetah
snow leopard
Egyptian cat
grille
mushroom
cherry
Madagascar cat
convertible
grille
pickup
beach wagon
fire engine
agaric
mushroom
jelly fungus
gill fungus
dead-man's-fingers
dalmatian
grape
elderberry
ffordshire bullterrier
currant
squirrel monkey
spider monkey
titi
indri
howler monkey

# Демо : распознаем изображения

# Using CNTK with C#/.NET API

08/30/2017 • 4 minutes to read • Contributors 

CNTK v2.2.0 provides C# API to build, train, and evaluate CNTK models. This section gives an overview of CNTK C# API. C# training examples are available in CNTK github repository.

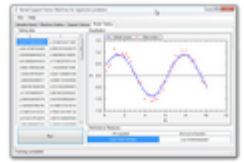
https://docs.microsoft.com/en-us/cognitive-toolkit/using-cntk-with-csharp

https://docs.microsoft.com/en-us/cognitive-toolkit/cntk-csharp-examples


Accord
Framework
.NET

## Classification.

Support Vector Machines , Logistic Regression , Decision Trees , Neural Networks , Deep Learning (Deep Neural Networks) , Levenberg-Marquardt with Bayesian Regularization , Restricted Boltzmann Machines , Sequence classification , Hidden Markov Classifiers and Hidden Conditional Random Fields .

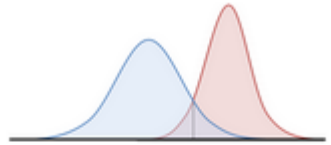


## Regression.

Multiple linear regression , Multivariate linear regression , polynomial regression , logarithmic regression. Logistic regression , multinomial logistic regression (softmax) and generalized linear models . L2-regularized L2-loss logistic regression , L2-regularized logistic regression , L1-regularized logistic regression , L2-regularized logistic regression in the dual form and regression support vector machines .

## Clustering.

K-Means , K-Modes , Mean-Shift , Gaussian Mixture Models , Binary Split , Deep Belief Networks , Restricted Boltzmann Machines . Clustering algorithms can be applied in arbitrary data, including images , data tables, videos and audio .

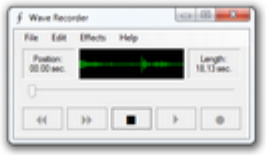


## Distributions.

Parametric and non-parametric estimation of more than 40 distributions. Univariate distributions such as Normal , Cauchy , Hypergeometric , Poisson , Bernoulli , and specialized distributions such as the Kolmogorov-Smirnov , Nakagami , Weibull , and Von-Mises distributions. Multivariate distributions such as the multivariate Normal , Multinomial , Independent , Joint and Mixture distributions .

## Imaging.

Interest and feature point detectors such as Harris , FREAK , SURF , and FAST . Grey-level Co-occurrence matrices , Border following , Bag-of-Visual-Words (BoW) , RANSAC-based homography estimation , integral images , haralick textural feature extraction , and dense descriptors such as histogram of oriented gradients (HOG) and Local Binary Pattern (LBP) . Several image filters for image processing applications such as difference of Gaussians , Gabor , Niblack and Sauvola thresholding .



## Audio and Signal.

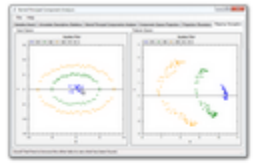
Load, parse, save, filter and transform audio signals , such as applying audio processing filters in both space and frequency domain . WAV files , audio capture , time-domain filters such as envelope , high-pass , low-pass , wave rectification filters. Frequency-domain operators such as differential rectification filter and comb filter with Dirac's delta functions . Signal generators for Cosine , Impulse , Square signals.

## Vision.

Real-time face detection and tracking , as well as general methods for detecting , tracking and transforming objects in image streams . Contains cascade definitions , Camshift and Dynamic Template Matching trackers . Includes pre-created classifiers for human faces and some facial features such as noses .

## Hypothesis Tests.

More than 35 statistical hypothesis tests , including one way and two-way ANOVA tests , non-parametric tests such as the Kolmogorov-Smirnov test and the Sign Test for the Median , contingency table tests such as the Kappa test , with variations for multiple tables , as well as the Bhapkar and Bowker tests; and the more traditional Chi-Square , Z , F , T and Wald tests .

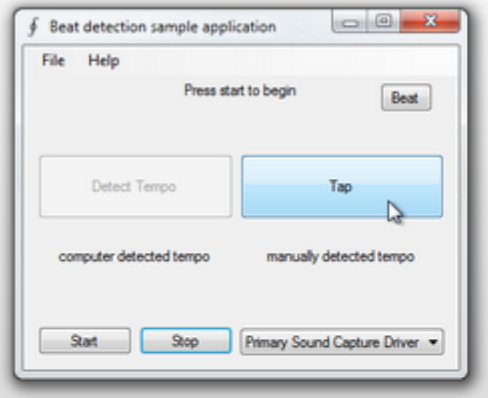


## Kernel Methods.

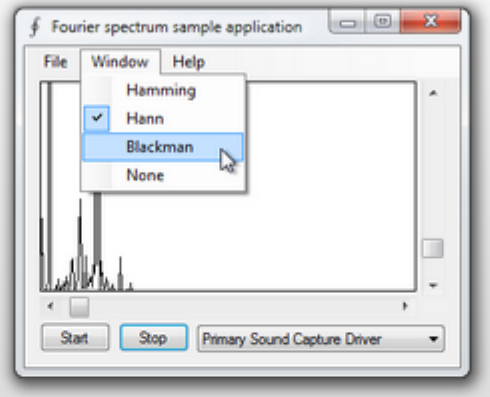
Kernel Support Vector Machines , Multi-class and Multi-label machines , Sequential Minimal Optimization , Least-Squares Learning , probabilistic learning , including special methods for linear machines such as LIBLINEAR's methods for Linear Coordinate Descent , Linear Newton Method , Probabilistic Coordinate Descent , Probabilistic Coordinate Descent in the Dual , Probabilistic Newton Method for L1 and L2 machines in both the dual and primal formulations .

Accord.NET Framework | About | Examples | Publications | Support | How to | Books

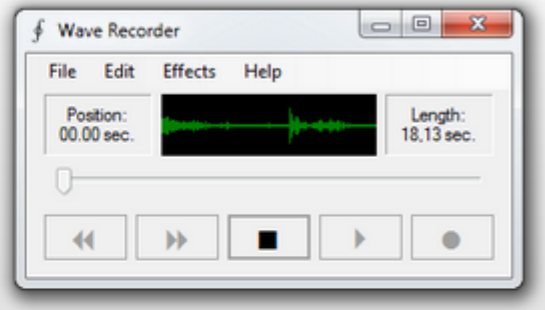
## Audio beat detector



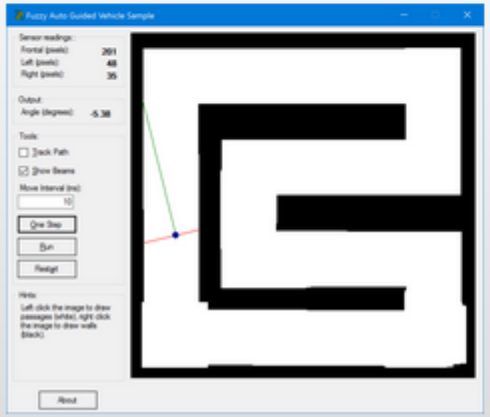

## Spectrum analyzer (Fourier)




## Wave Recorder



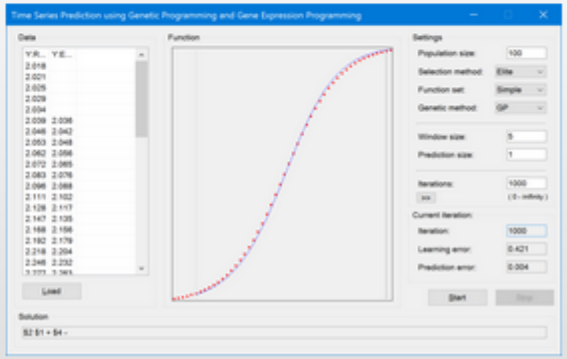

## Robot (Inference)



## Sets (Fuzzy, Linguistic)

Sets (Fuzzy, Linguistic)

## Genetic Programming

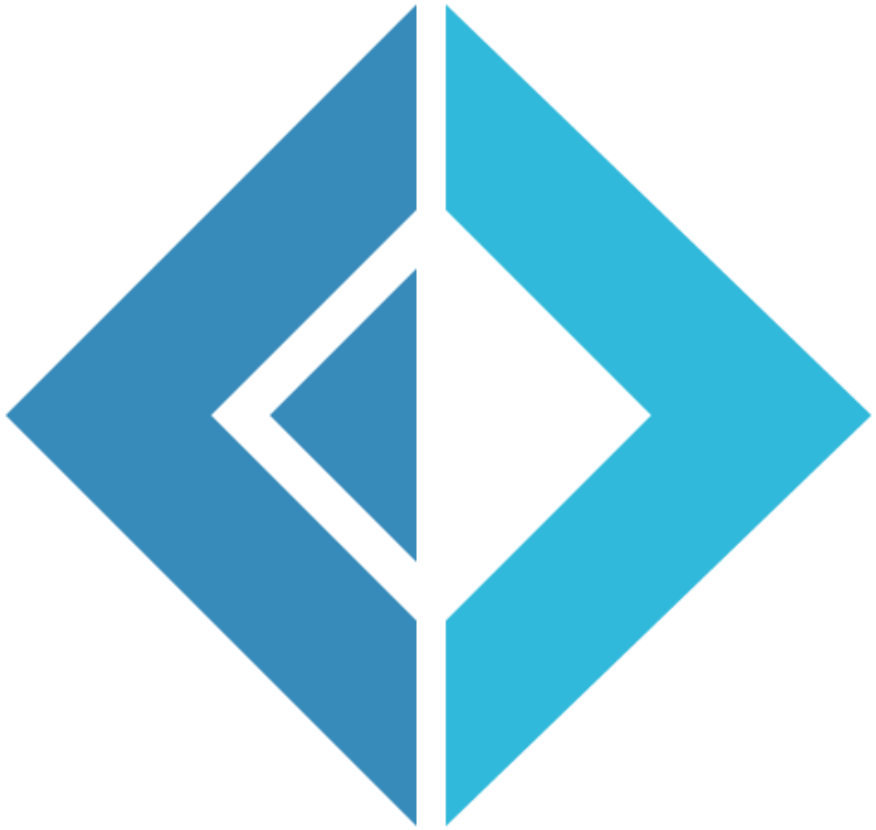


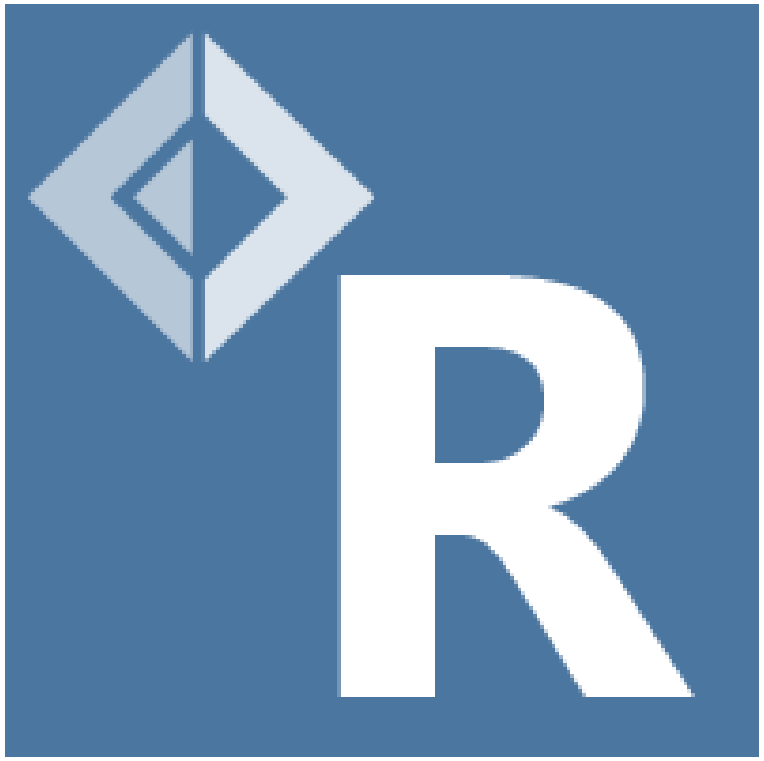
http://accord-framework.net/samples.html

# Что такое NLP?


Stanford University
S
NLP
Natural Language Processing


OPEN
NLP
TM

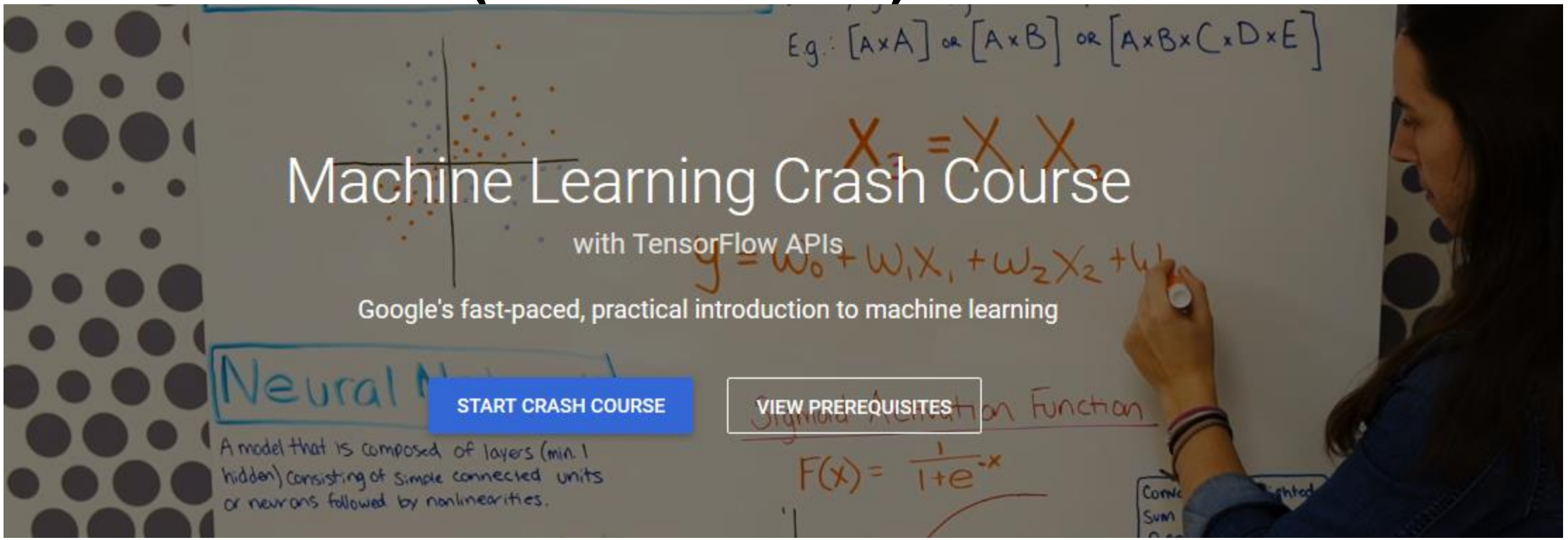



R

```
let tickers =
  [ "MSFT"; "AAPL"; "X"; "VXX"; "SPX"; "GLD" ]
let data =
  [ for t in tickers ->
      printfn "got one!"
      t, getStockPrices t 255 |> R.log |> R.diff ]

// Create an R data frame with the data and call 'R.pairs'
let df = R.data_frame(namedParams data)
R.pairs(df)
```

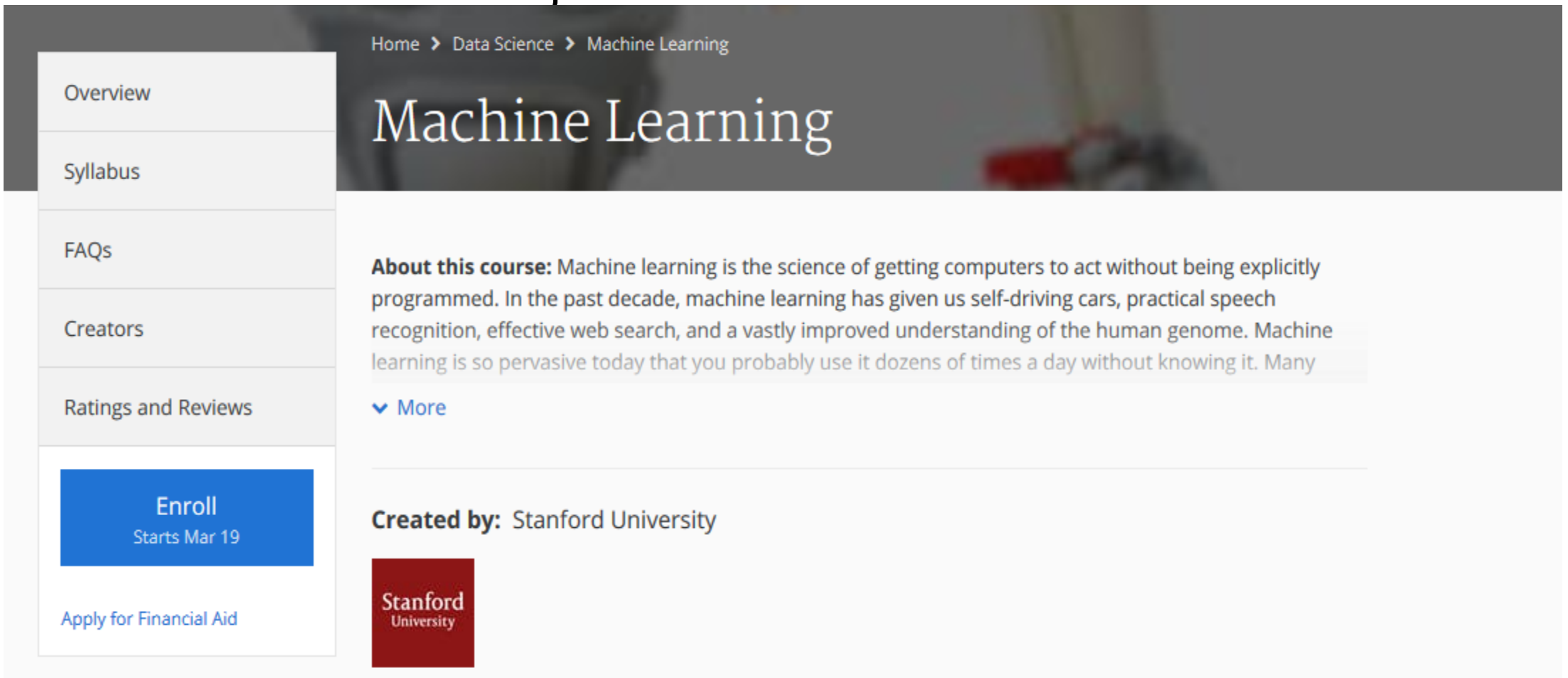
```
let tickers =
  [ "MSFT"; "AAPL"; "X"; "VXX"; "SPX"; "GLD" ]
let data =
  [ for t in tickers ->
      printfn "got one!"
      t, getStockPrices t 255 |> R.log |> R.diff ]

// Create an R data frame with the data and call 'R.pairs'
let df = R.data_frame(namedParams data)
R.pairs(df)
```

# Machine Learning Crash Course (Google)



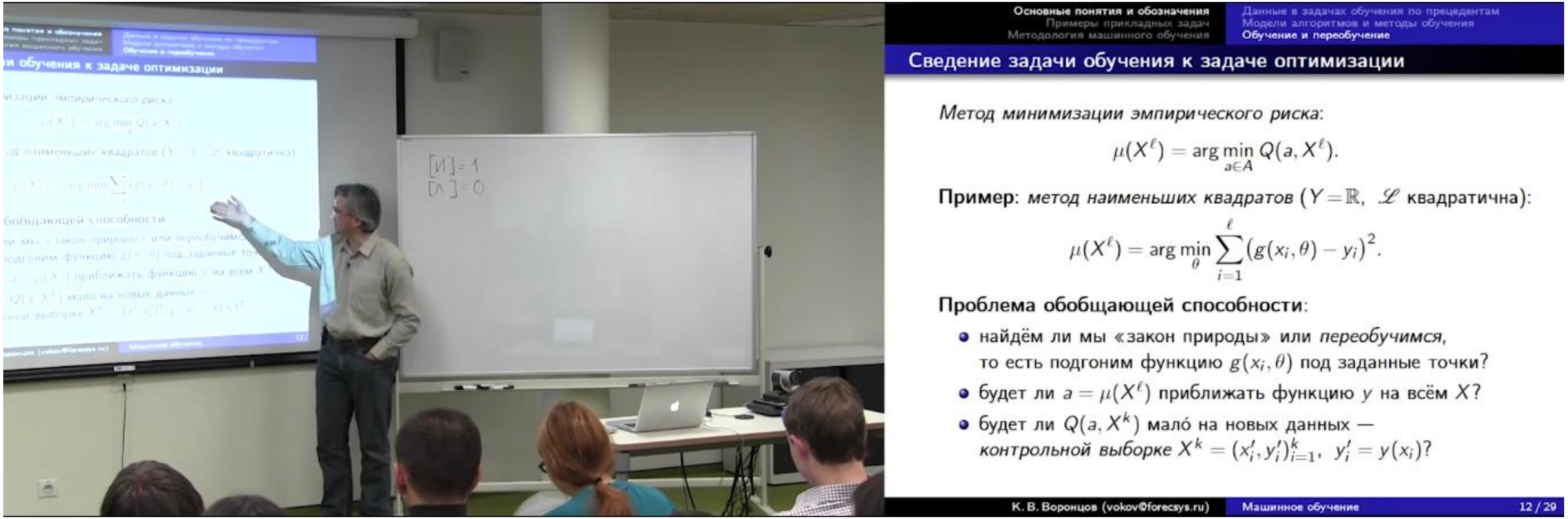

https://developers.google.com/machine-learning/crash-course/

# Machine Learning by Andrew Ng



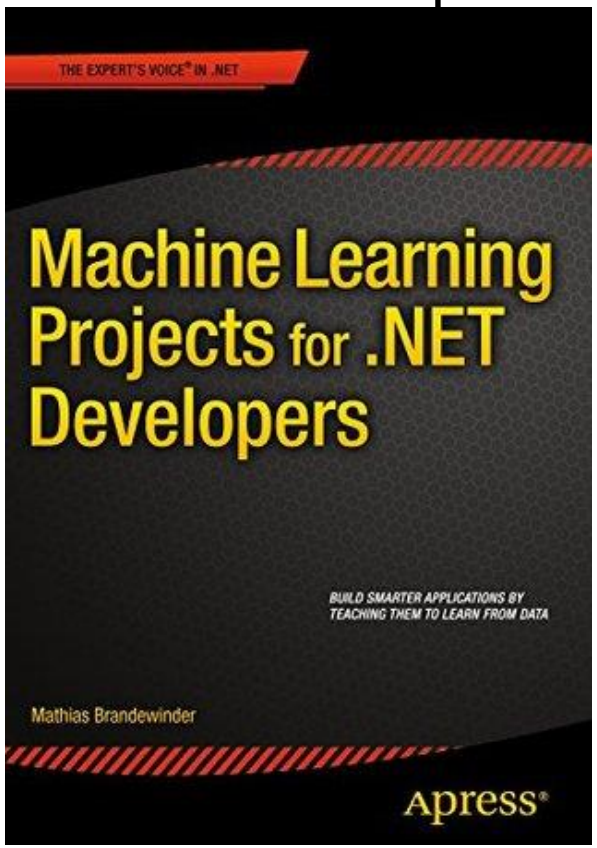

https://ru.coursera.org/learn/machine-learning

# Курс от ШАД (Андрей Воронцов)




http://bit.ly/2DygyXH

# Mathias Brandewinder – Machine Learning Projects for .NET Developers




https://www.apress.com/br/book/9781430267676

# Вопросы?

nevoroman@gmail.com

nevoroman