

# AI AND TATTOOS

How we trained a neural network to recognize and detect tattoos and styles

TATTOODO

ME

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TATTOODO

# TATTOODO

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From booking, inspiration and custom designs to lifestyle and entertainment. At Tattoodo we cover all aspects of the global and ever-growing tattoo culture.

We work to deliver relevant content daily and brand new services to our audience.



# WHO WE ARE

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With 20 million monthly users, Tattoodo has fast become the **no. 1 destination for tattoo lovers** around the world!

**1.7B**

monthly views

**20M**

monthly users

**18M**

Facebook likes

**1.4M**

reg. app users

**90k**

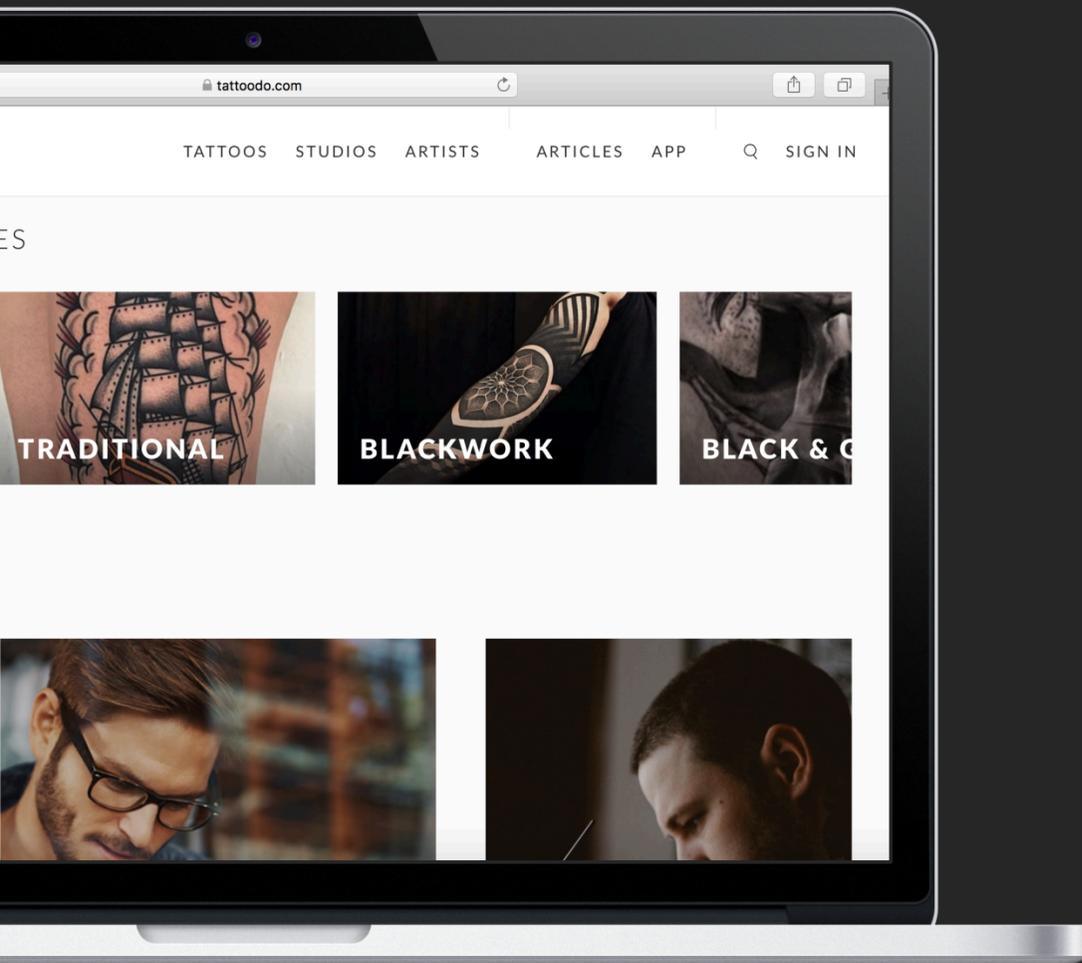
registered artists

**500k**

Tattoos

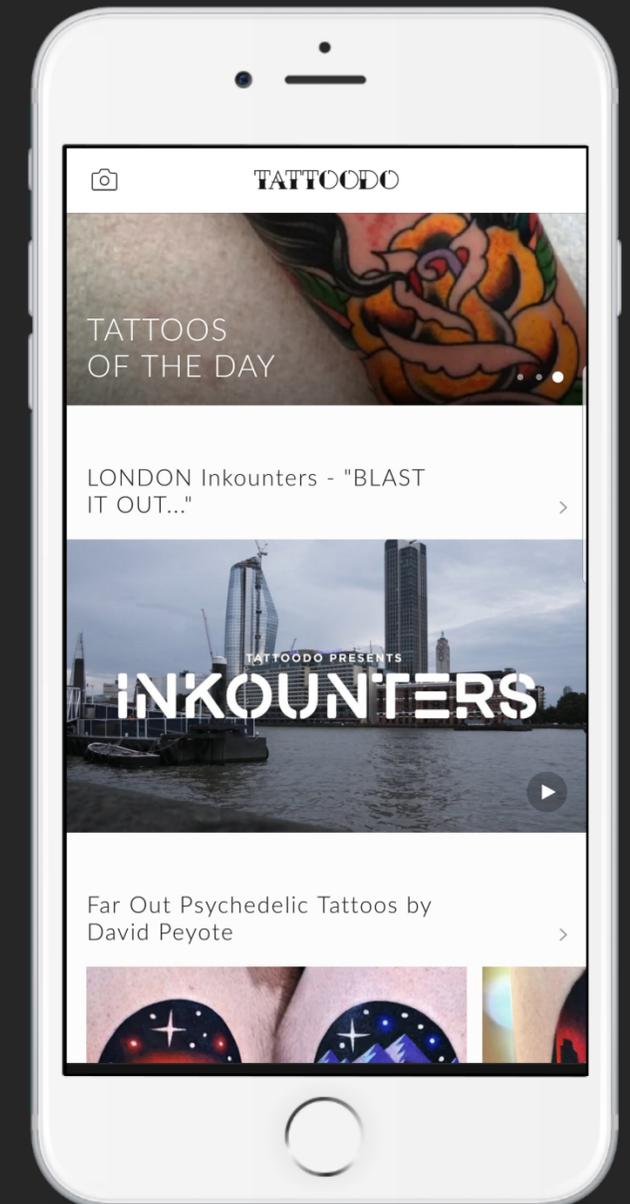


# OUR PLATFORM



Our platform has more than 1.000.000 registered artists and tattoo fans.

Tattoodo is used to discover, collect and share inspiration from a curated collection of tattoo images and articles.





# TATTOO STYLES AND MOTIFS

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**style:** a particular procedure by which something is done; a manner or way; a distinctive appearance, typically determined by the principles according to which something is designed

**motif:** a decorative image or design, especially a repeated one forming a pattern; a dominant or recurring idea in an artistic work

*text source: Google*

# WHY EVEN **CLASSIFY** AND **DETECT** TATTOOS?

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## Personalized feeds

Feeds generated for each of our users based on their interests ie. styles and motifs.

## Improving search results

By calculating the tattoo concentration, we can elude pictures of artists, store fronts and other \*\*\*\* people upload from search results



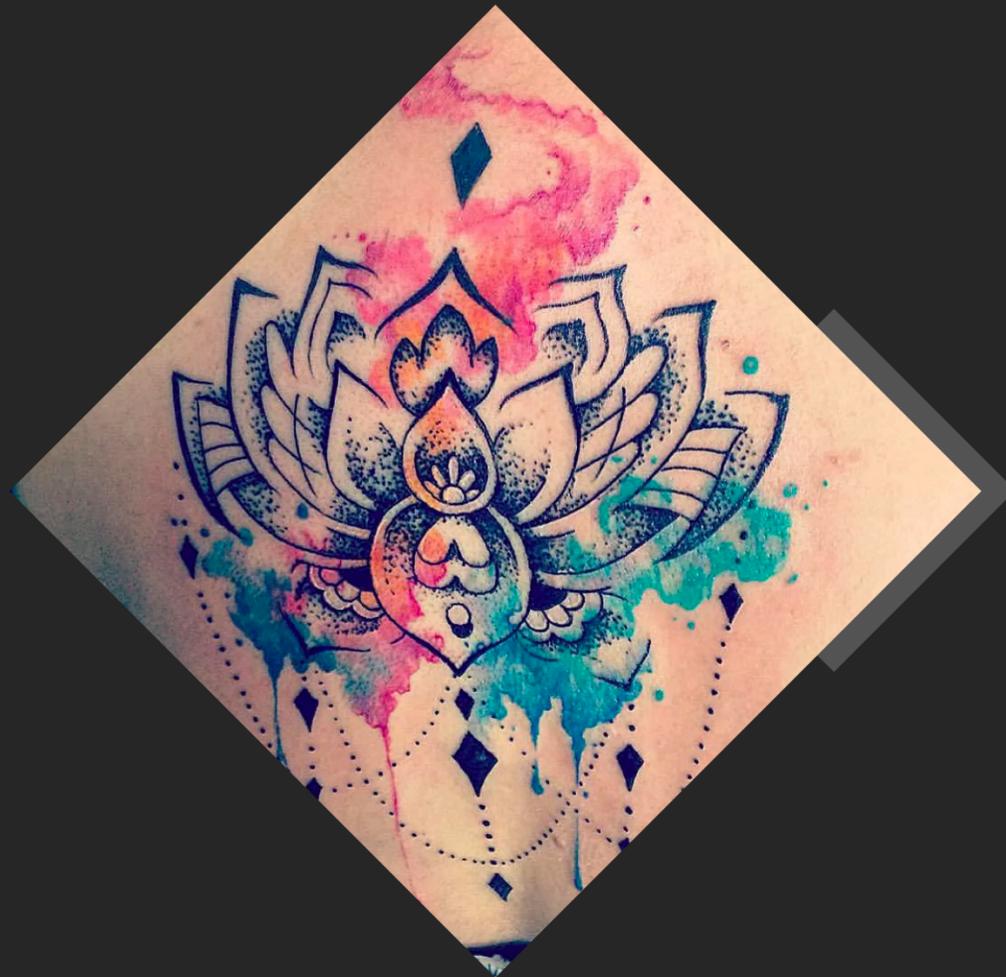


# WHY **ARTIFICIAL INTELLIGENCE**

At Tattodo, we spend a lot of time and effort on classifying the tattoo pictures that are uploaded. A community member is able to provide a textual description and tag the tattoo with arbitrary hashtags, which obviously is a lot of responsibility to put in the hands of one member.

# STYLE **EXPLAINED**

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**Watercolor tattoos** mimic streaks or spots of color similar to splashing paint on a canvas. Often the tattoo might be realistic or mainly line-work, and the watercolor effect might be added in the background or around the tattoo as an addition. Watercolor tattoos are, of course, very colorful and are coupled with themes of nature, animals and flowers.

# OTHER POPULAR STYLES

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JAPANESE



TRIBAL



TRASH POLKA STYLE



FINELINE



TRADITIONAL

# CAFFE, TENSORFLOW & NVIDIA DIGITS

**Caffe** is a deep learning framework made with expression, speed, and modularity in mind.

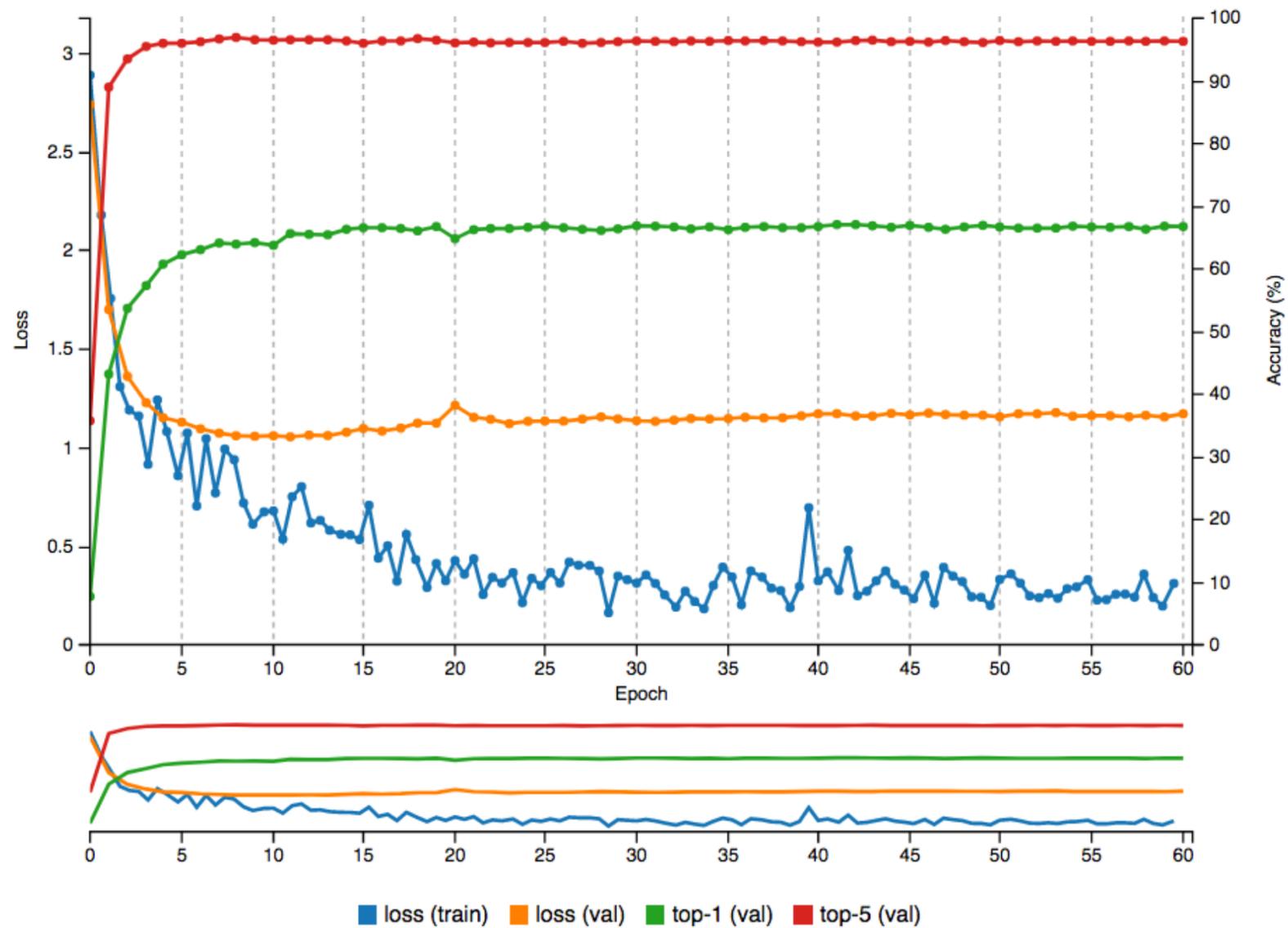
**TensorFlow** was originally developed by researchers and engineers working on the Google Brain team within Google's Machine Intelligence Research organization for the purposes of conducting machine learning and deep neural networks research.

The **NVIDIA** Deep Learning GPU Training System (**DIGITS**) puts the power of deep learning into the hands of engineers and data scientists.



# TRAINING THE CLASSIFICATION MODEL

Transfer learned from **InceptionV3**  
Solver: **Stochastic Gradient Descent**  
Train time: 30 mins on a Tesla V100 GPU

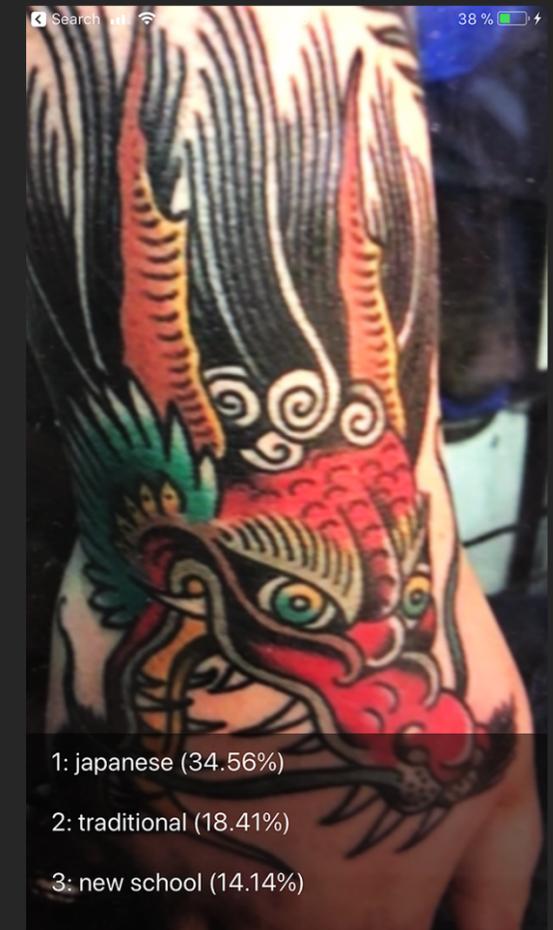
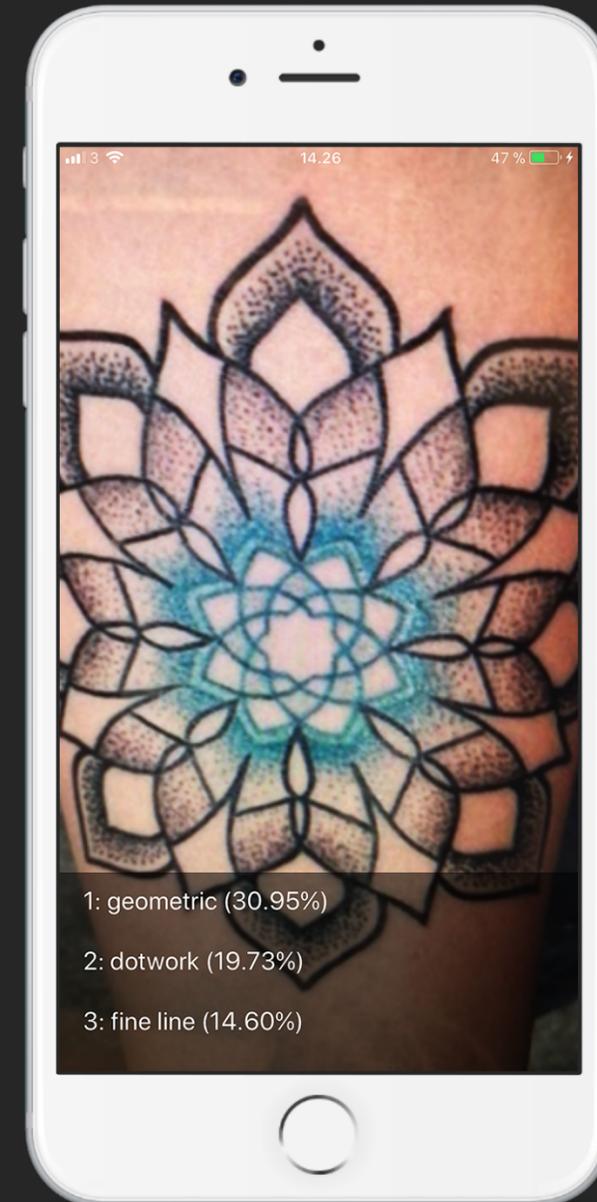


# INITIAL CLASSIFICATION RESULTS



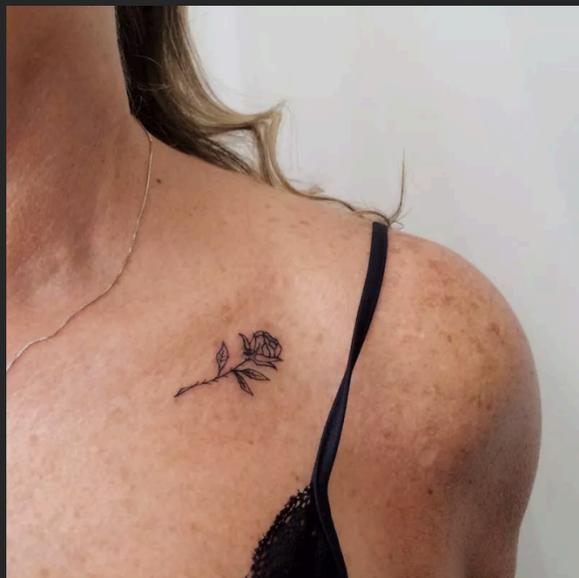
CoreML, available on iOS 11, allows you to integrate trained machine learning models into your app.

**AI JAMES**  
**is born!**

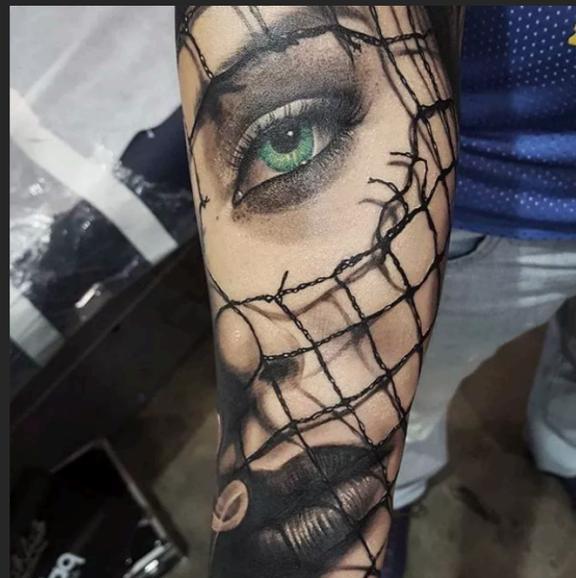


# EXCLUDED STYLES

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MINIMALISM



REALISM



ABSTRACT



BAD FOR  
CLASSIFICATION  
TRAINING  
**EXAMPLES**

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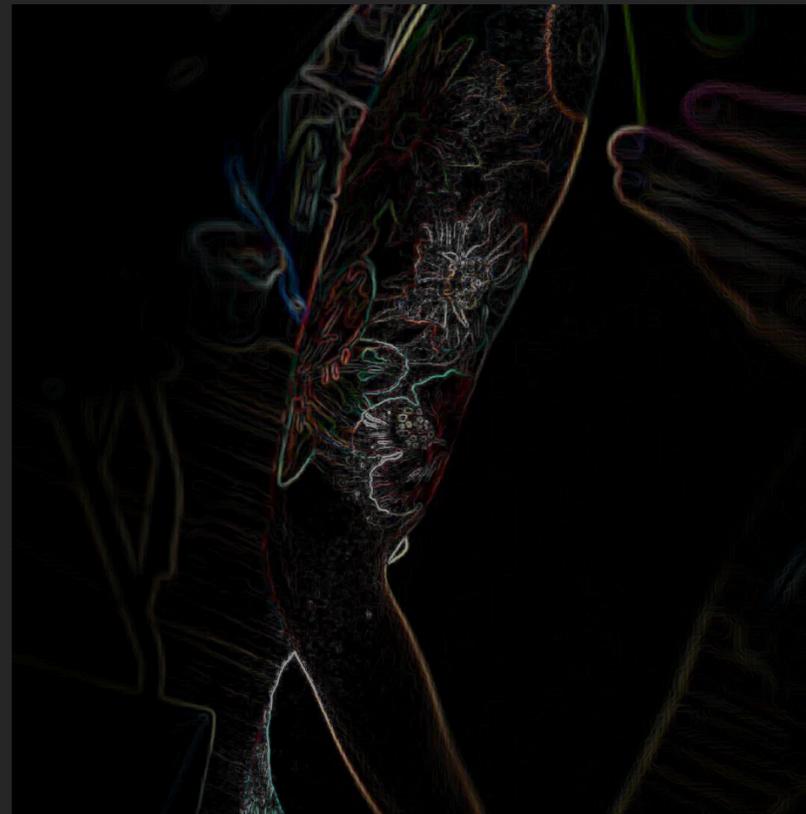
# ENTROPY CROPPING - not too good!

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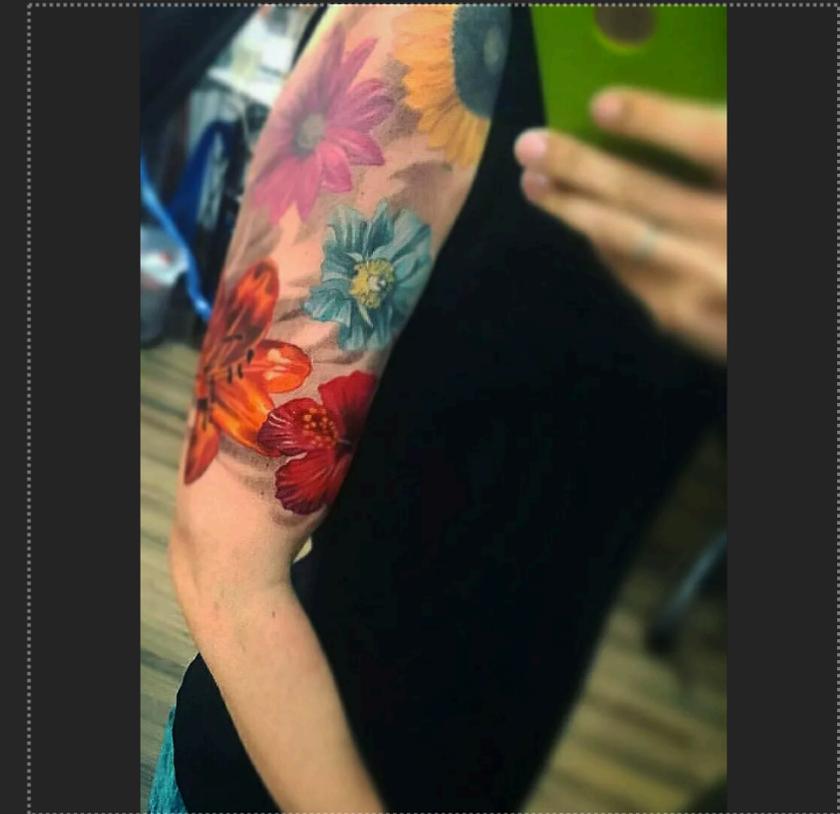
**Original image**

Image we are using to demonstrate how entropy cropping works.



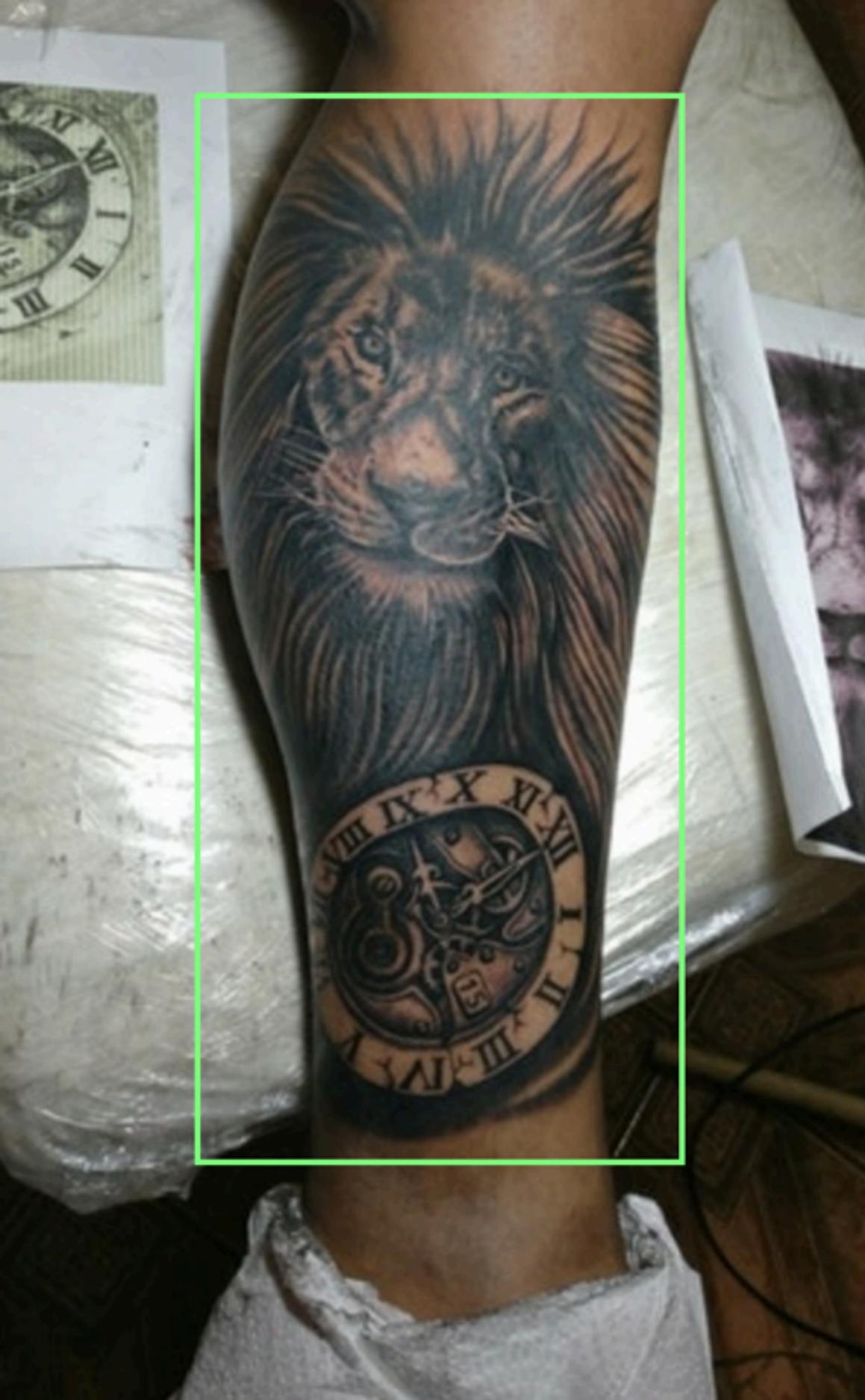
**High contrast**

The modified version which demonstrates the point of interest in the image.



**Cropped image**

Result of entropy cropping based on high contrast areas.



# ANNOTATION TOOL

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Tool I developed in Vue.js in order to help us get higher quality training data.

With this tool we are better able to isolate and categorize one or more tattoos in a single image.

Wasted time again... :(

# IMAGE SEGMENTATION

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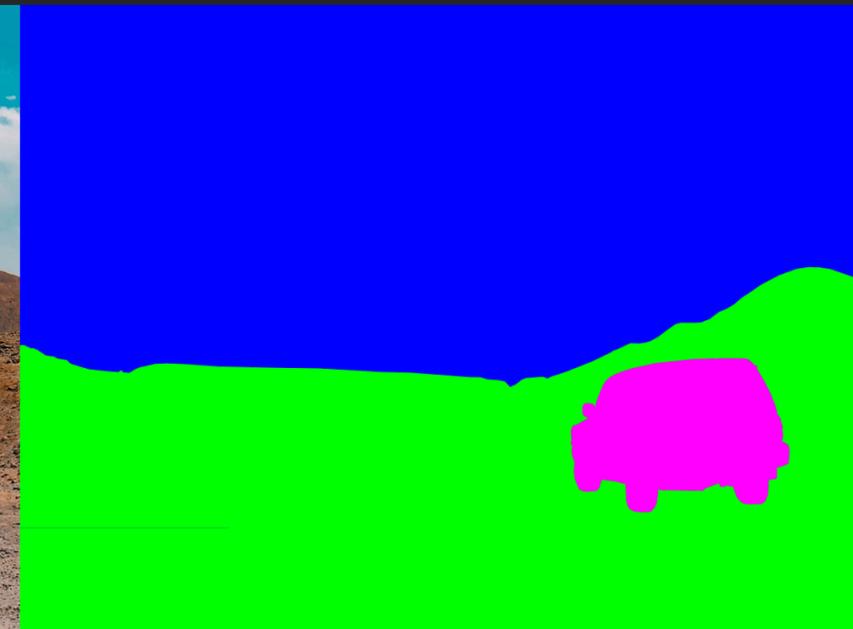
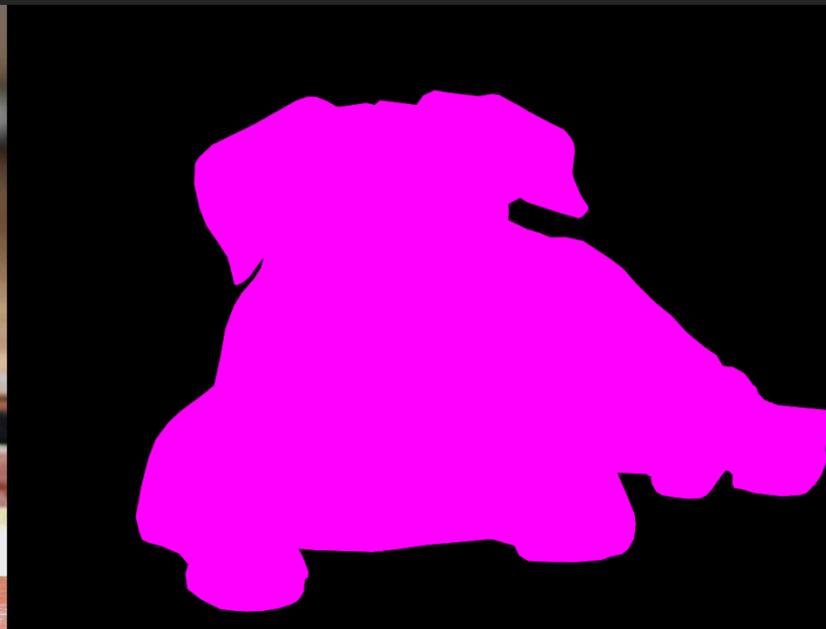
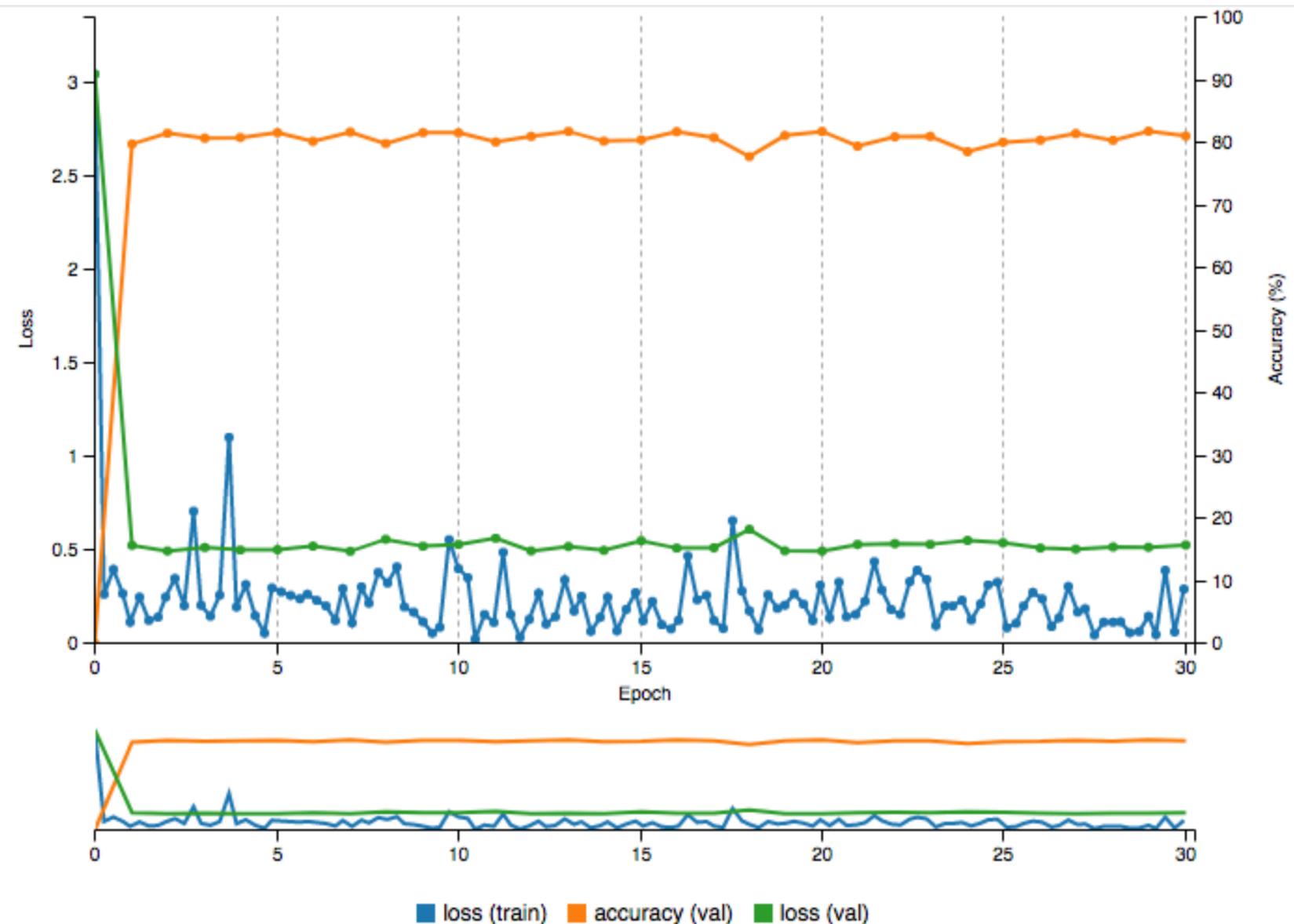


Image segmentation is the process of partitioning a digital image into multiple segments.

The goal of segmentation is to simplify and/or change the representation of an image into something that is more meaningful and easier to analyze.

*text source: Wikipedia*

# TRAINING THE SEMANTIC SEGMENTATION MODEL



Transfer learned from a **FCN** converted **AlexNet**

Solver: **Stochastic Gradient Descent**

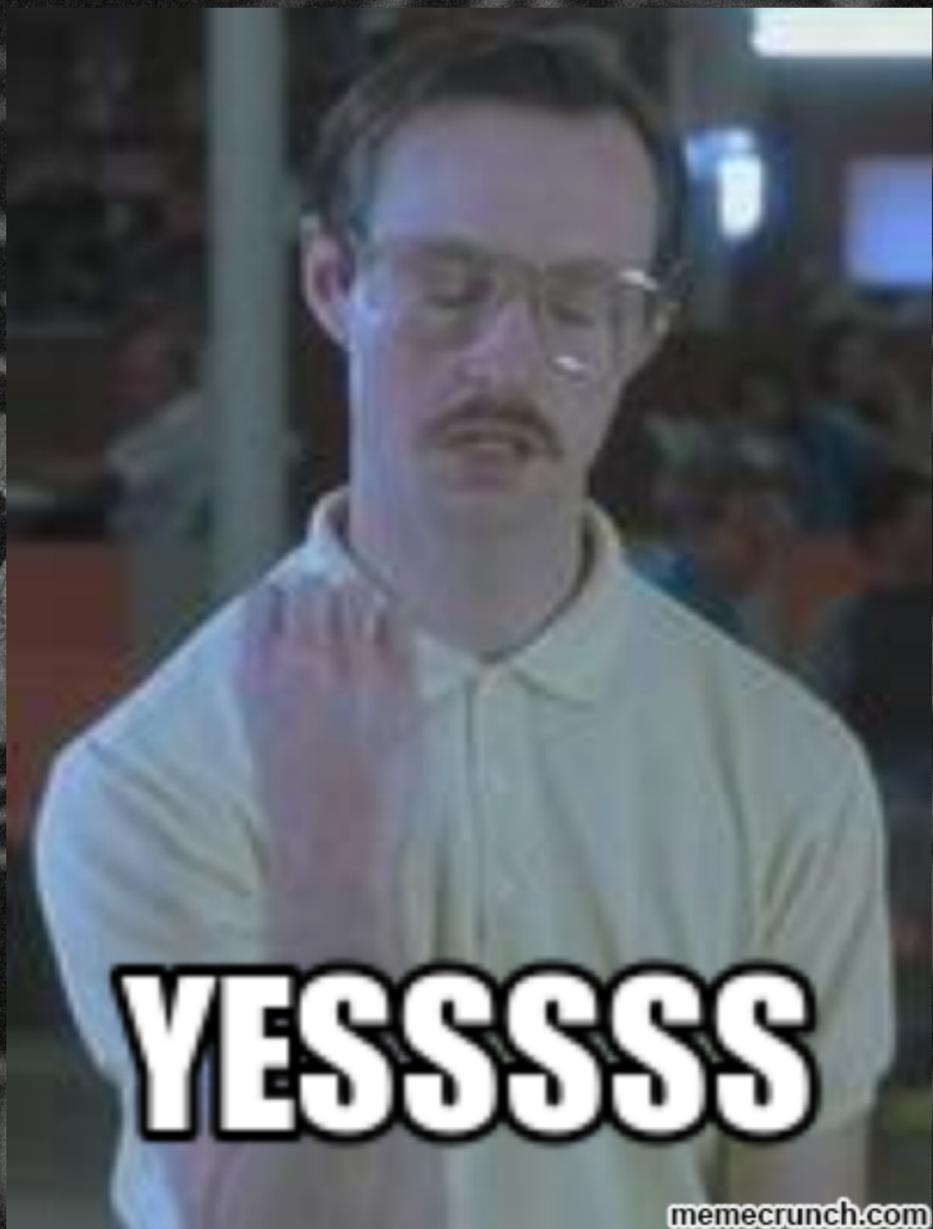
Train time: **6 hours**



# THE SEGMENTATION RESULTS

Actual results we got with  
the **image segmentation**.





# USING SEGMENTATION IN TATTOO SEARCH

No penalty, search query: "Ami James"

<p>Win a trip to Miami and get tattooed by Ami James</p> <p>Download the app &amp; join the competition</p> <p>Get App</p> <p><b>What's at stake</b></p> <ul style="list-style-type: none"> <li>A Round Trip to Miami</li> <li>A Three-Night Hotel Stay</li> <li>A Tattoo by Ami James</li> </ul> <p>Score: <b>1299.6564</b> Concentration: <b>0.00%</b></p>	<p>Win a trip to Miami and get tattooed by Ami James</p> <p>Download the app &amp; join the competition</p> <p>Get App</p> <p><b>What's at stake</b></p> <ul style="list-style-type: none"> <li>A Round Trip to Miami</li> <li>A Three-Night Hotel Stay</li> <li>A Tattoo by Ami James</li> </ul> <p>Score: <b>1173.0101</b> Concentration: <b>0.00%</b></p>	<p>Score: <b>1161.6285</b> Concentration: <b>28.53%</b></p>	<p>Score: <b>1128.7357</b> Concentration: <b>6.10%</b></p>	<p>Score: <b>936.4263</b> Concentration: <b>0.66%</b></p>
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Penalizing under 25%, search query: "Ami James"

<p>Score: <b>1161.6285</b> Concentration: <b>28.53%</b></p>	<p>Score: <b>790.2487</b> Concentration: <b>38.68%</b></p>	<p>Score: <b>541.61005</b> Concentration: <b>29.88%</b></p>	<p>Score: <b>460.51703</b> Concentration: <b>52.76%</b></p>	<p>Score: <b>439.44492</b> Concentration: <b>27.42%</b></p>
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**01**

## Data quality

with image segmentation we can improve training data



**02**

## Improve neural network

data quality will improve accuracy of style recognitions and segmentation



**03**

## More implementations

higher accuracy will allow us to use it in an unattended fashion



## NEXT STEPS

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Use tattoo concentration and style recognition in related post search, suggest style and quality assessment upon upload.



# THANK YOU!

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