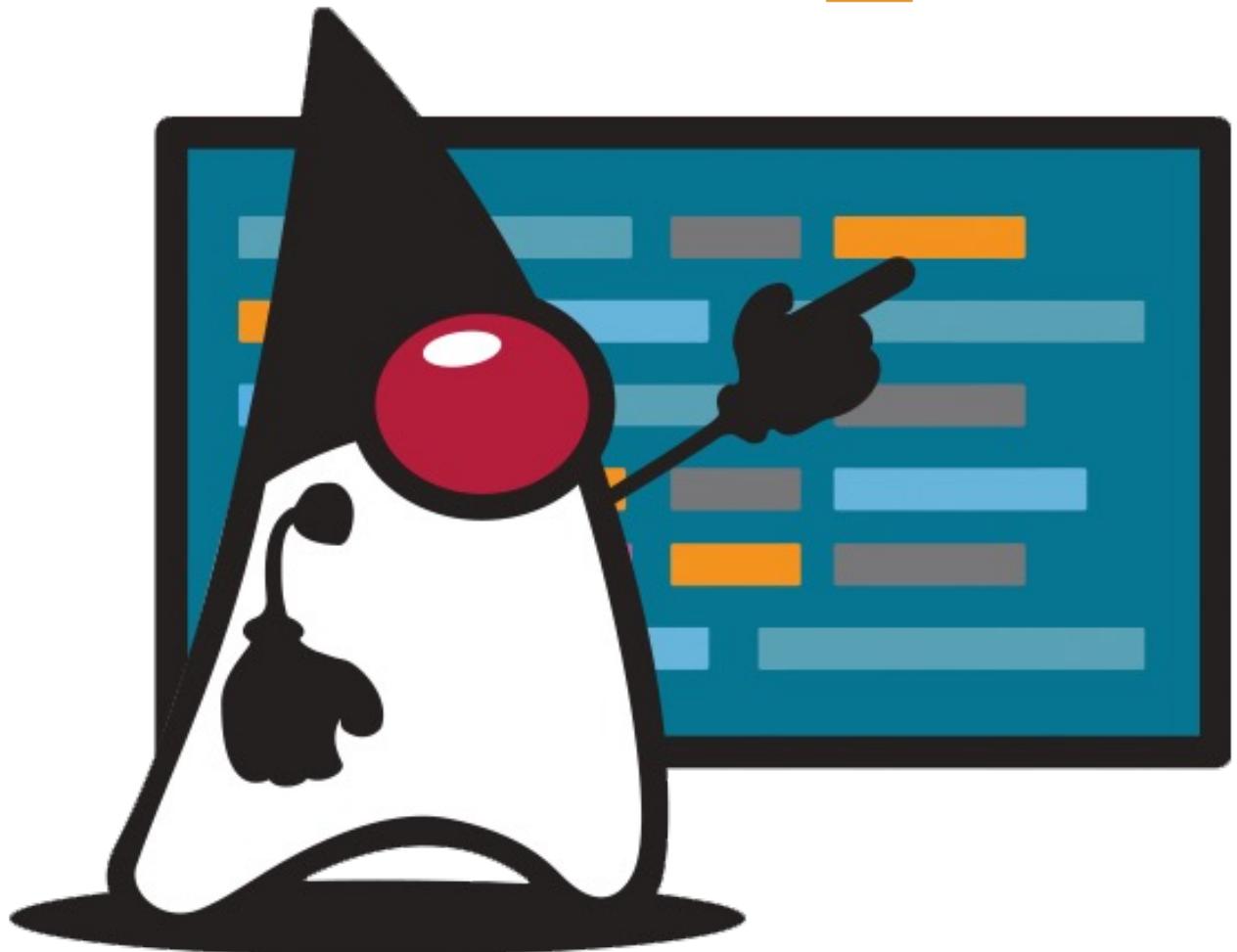


Java in Education

JUG Presenter Name here
For Junior Developers and Students

Prepared by Ken Fogel & the JCP Executive Committee (EC) Java in Education Working Group



Java Language Enhancements

This presentation looks at enhancements to the Java language

These enhancements help dispel some of the myths surrounding Java.

It is about why Java should be the language taught at all levels in schools today.

There is even a comparison of a program in Java and Python.

JShell - Read- Evaluate- Print Loop (REPL) JDK 9

A tool for simplifying instruction.

Execution as you enter code and press return.

Immediate response line by line.

You can also write entire methods first and then execute them.

Ideal in teaching Java one line at a time.

JEP 330 - Launch Single-File Source-Code Programs JDK 11

- Addresses the overhead of running code
 - Traditional Style
 - Two-step to execution
 - javac
 - java -jar
 - Single-File Source-Code Style
 - One-step to execution
 - java
 - If the file has a public class with a main it compiles and executes
 - Works with preview features as well as established features
 - Single file may contain multiple classes
 - This may be the second* most significant new capability for writing Java for those wishing to learn the language
 - No need to master an IDE to learn Java.

* The first will be shown on slide 18.

var – reduction of redundancy reduction JDK 10

No more:

- `MyClass m = new MyClass();`

It now becomes:

- `var m = new MyClass();`

Encourages only
creating objects with
initialization

- Will reduce the occurrence of the
dreaded `NullPointerException`

text blocks (15)

Finally, what you enter into your source code is what you get

Especially useful for Strings that contain HTML, XML and JSON

Who doesn't like writing three quotation marks in a row



Old School Concatenation

```
String htmlStr = "<html><head><link rel='stylesheet' "
+ "href='styles/main.css' "
+ "type='text/css' /><title>The Learning Servlet</title></head>"
+ "<body><h1>GET method</h1>"
+ "<form id='form:index' action='index.html' >"
+ "<br/><input type='submit' value='Return to Home page' /></form>"
+ "</body></html>";
```

New School Text Block JDK 15

```
String htmlStr = """
<html>
  <head>
    <link rel='stylesheet' href='styles/main.css' type='text/css' />
    <title>The Learning Servlet</title>
  </head>
  <body>
    <h1>GET method</h1>
    <form id='form:index' action = 'index.html'>
      <br/>
      <input type= 'submit' value='Return to Home page' />
    </form>
  </body>
</html>""";
```

But wait, there is more . . . String formatted JDK 15

```
out.println("""
<html>
  <head>
    <title>Just Servlet Output</title>
    <link rel='stylesheet' href='styles/main.css' type= 'text/css' />
  </head>
  <body>
    <h1>Thanks for joining our email list</h1>
    <p>Here is the information that you entered:</p>
    <label>Email:</label>
    <span>%s</span>
  </body>
</html>""".formatted(user.getEmailAddress()));
```

switch – an expression & without a break JDK 14

A switch that can be explained sensibly

Reduction in duplication of code when used to set a value

Switch expressions or switch rules

The end of break, all cases terminate!

Which would you prefer to learn or teach?

```
double value = 0;  
switch (point) {  
    case NORTH:  
        value = 12.12;  
        break;  
    case SOUTH:  
        value = 14.14;  
        break;  
    case EAST:  
        value = 16.16;  
        break;  
    case WEST:  
        value = 18.18;  
        break;  
}
```

```
double value = switch (point)  
{  
    case NORTH -> 12.12;  
    case SOUTH -> 14.14;  
    case EAST -> 16.16;  
    case WEST -> 18.18;  
    default -> 0.0;  
};
```

And then there is the pattern matching switch.
Still in preview in JDK 20.

```
Object x = "4";
String designation = switch (x) {
    // case Integer i when i > 4 && i < 12 -> "child";
    case Integer i when i < 12 -> "child";
    case Integer i when i < 18 -> "teenager";
    case Integer i when i < 25 -> "young adult";
    case Integer i when i < 65 -> "adult";
    case Integer i when i >= 65 -> "senior";
    default -> "Not an Integer";
};

System.out.printf("Designation is %s%n", designation);
```

records – boilerplate reduction with immutable flavouring and a dash of compact constructor JDK 16

Data objects are known for boilerplate code:

- Initializing constructors, setters, getters, equals, hashCode, and toString

To the rescue is the immutable record

More than just a simplification of a bean

It's the path to objects defaulting to immutability

And then there is the compact constructor

- Validating initial values without a separate constructor

No setters, just simple getters.

Implied equals, hashCode and toString.

And what a lovely compact constructor for validation.

```
public record Person(String firstName,  
                     String lastName,  
                     int age,  
                     String position,  
                     LocalDate birthday) {  
  
    public Person{  
        if (age < 18) {  
            throw new IllegalArgumentException("Too young");  
        }  
    }  
}
```

Virtuous
Virtual
Threads
preview in
JDK 20, final
version in
JDK 21.

```
public class VirtualThread  
    extends Thread { . . . }  
  
public void perform() {  
    for (int i = 0; i < 5; ++i) {  
        Thread.ofVirtual()  
            .name("Thread # " + i)  
            .start(new VirtualThread());  
    }  
}
```



Paving the on-ramp

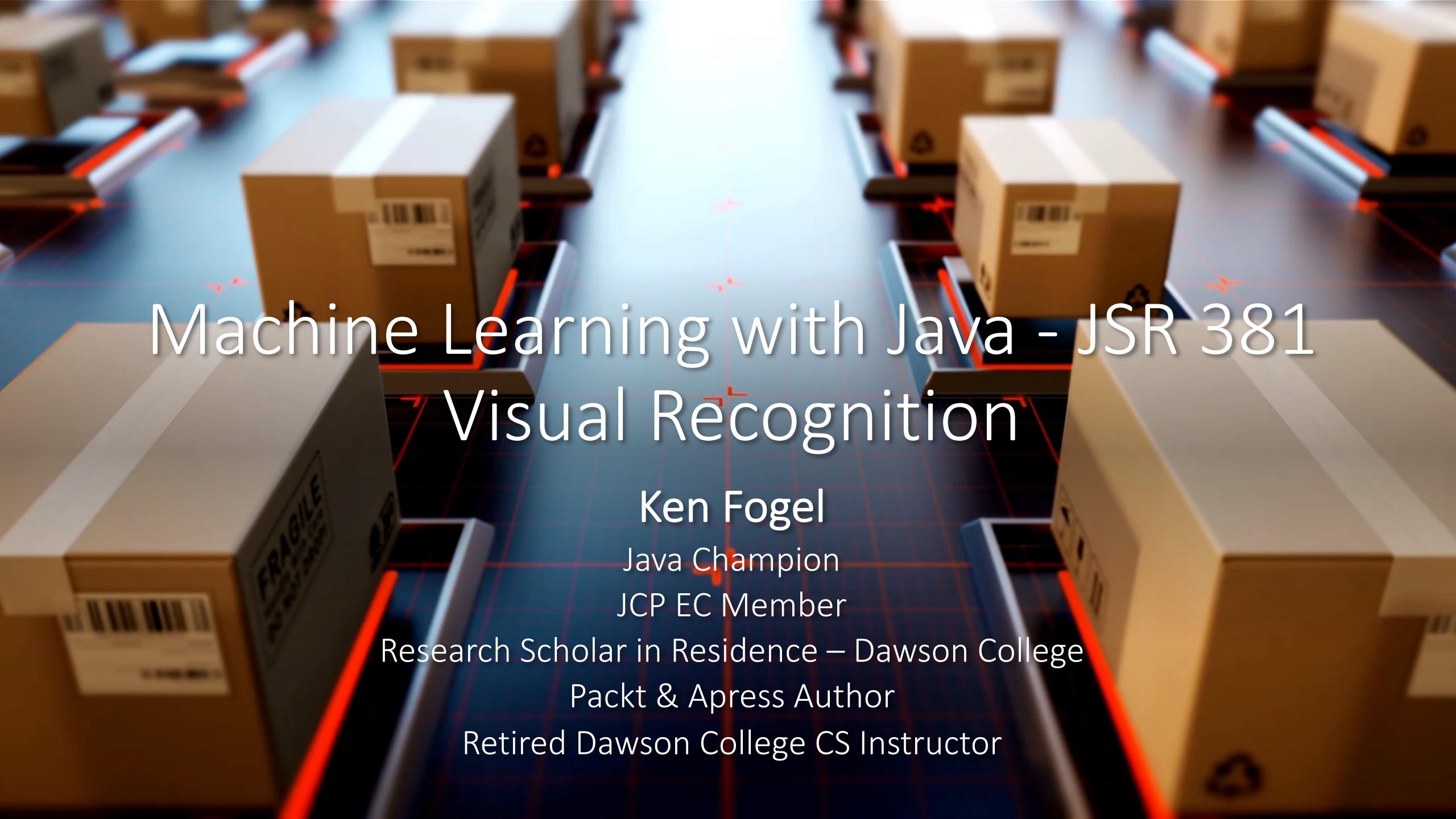
- In September 2022 Java Language Architect Brian Goetz released a paper called Paving the on-ramp
- (<https://openjdk.org/projects/amber/design-notes/on-ramp>)

```
public class HelloWorld {  
    public static void main(String[] args) {  
        System.out.println("Hello World");  
    }  
}
```

will
become

```
void main() {  
    println("Hello World");  
}
```

- Java can be learned without all the OOP decorations
- Methods can be written
- New learners can focus on syntax initially



Machine Learning with Java - JSR 381

Visual Recognition

Ken Fogel

Java Champion

JCP EC Member

Research Scholar in Residence – Dawson College

Packt & Apress Author

Retired Dawson College CS Instructor

First, some credit for the source material in this presentation

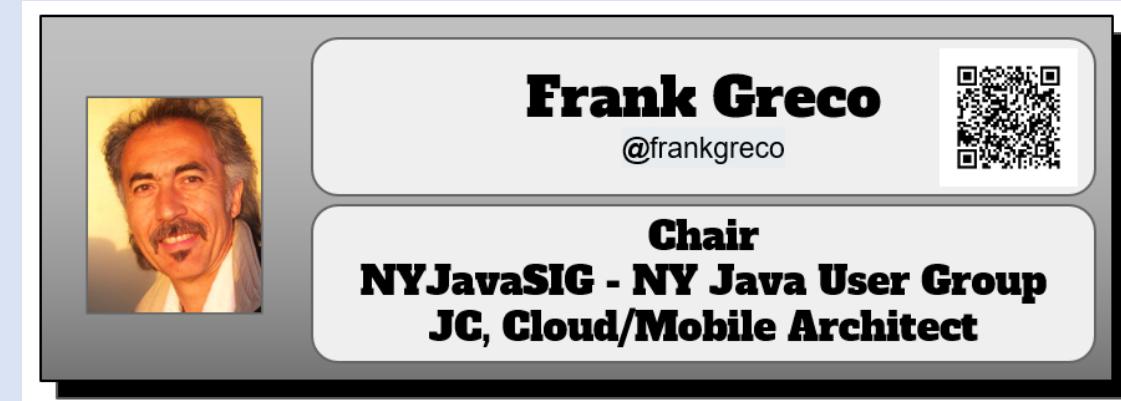
- This presentation is based on the work of the following two developers/researchers, with their permission, that are part of the team who developed JSR 381



A profile card for Zoran Severac. It features a small square photo of a man with glasses and a blue shirt on the left. To the right of the photo, the name "Zoran Severac" is printed in bold black font, followed by the handle "@zsevarac" and a QR code.

Zoran Severac
@zsevarac

AI Researcher
Univ of Belgrade, Serbia
JC



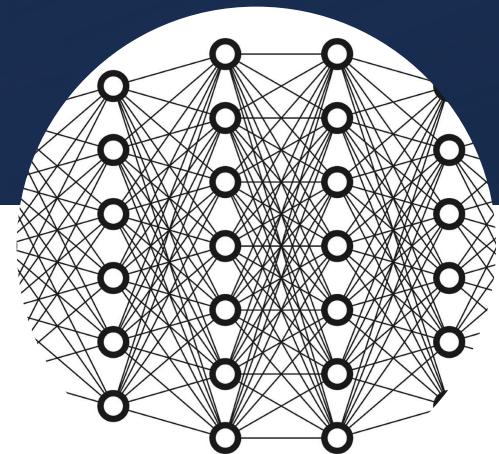
A profile card for Frank Greco. It features a small square photo of a man with a mustache and dark hair on the left. To the right of the photo, the name "Frank Greco" is printed in bold black font, followed by the handle "@frankgreco" and a QR code.

Frank Greco
@frankgreco

Chair
NYJavaSIG - NY Java User Group
JC, Cloud/Mobile Architect

Machine Learning

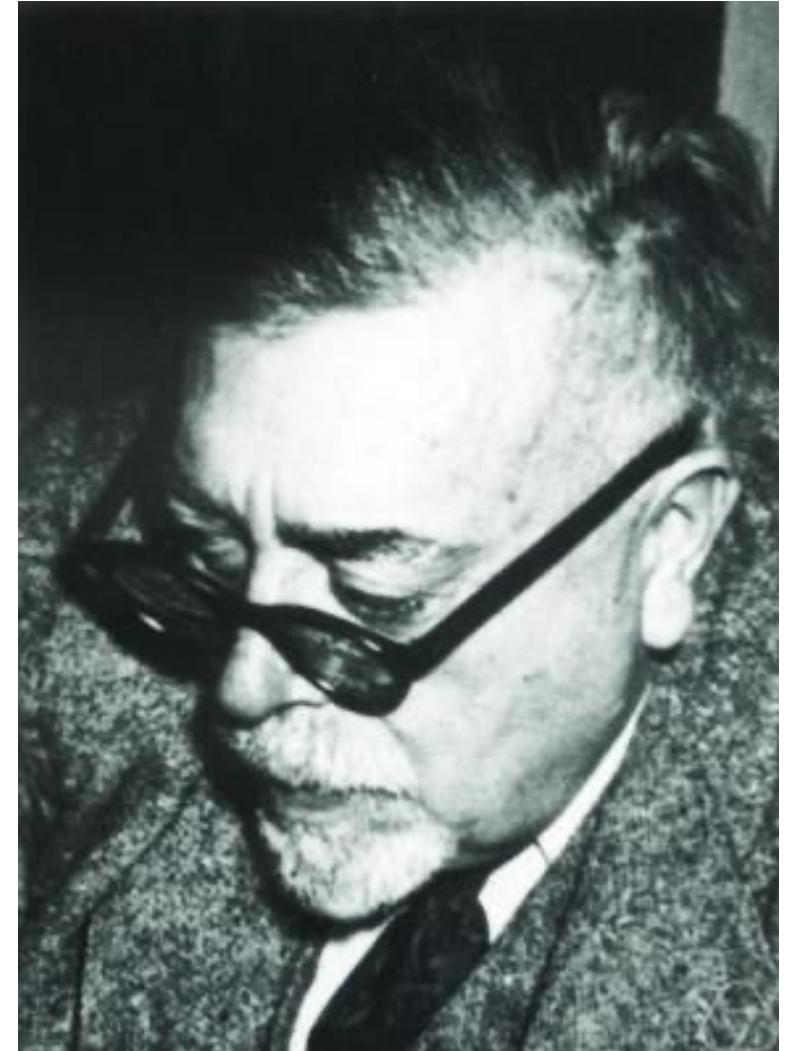
Huge Impact on Everything...



This was AI
before it was
called “AI”

***“One of the most
interesting aspects
of the world is that
it can be
considered to be
made up of
patterns”***

Norbert Wiener -
1894-1964 - MIT
Cybernetics (1948)
- early steps to
modern AI



The Core of Machine Learning

Recognizing PATTERNS in data

and

Making PREDICTIONS against that

data.

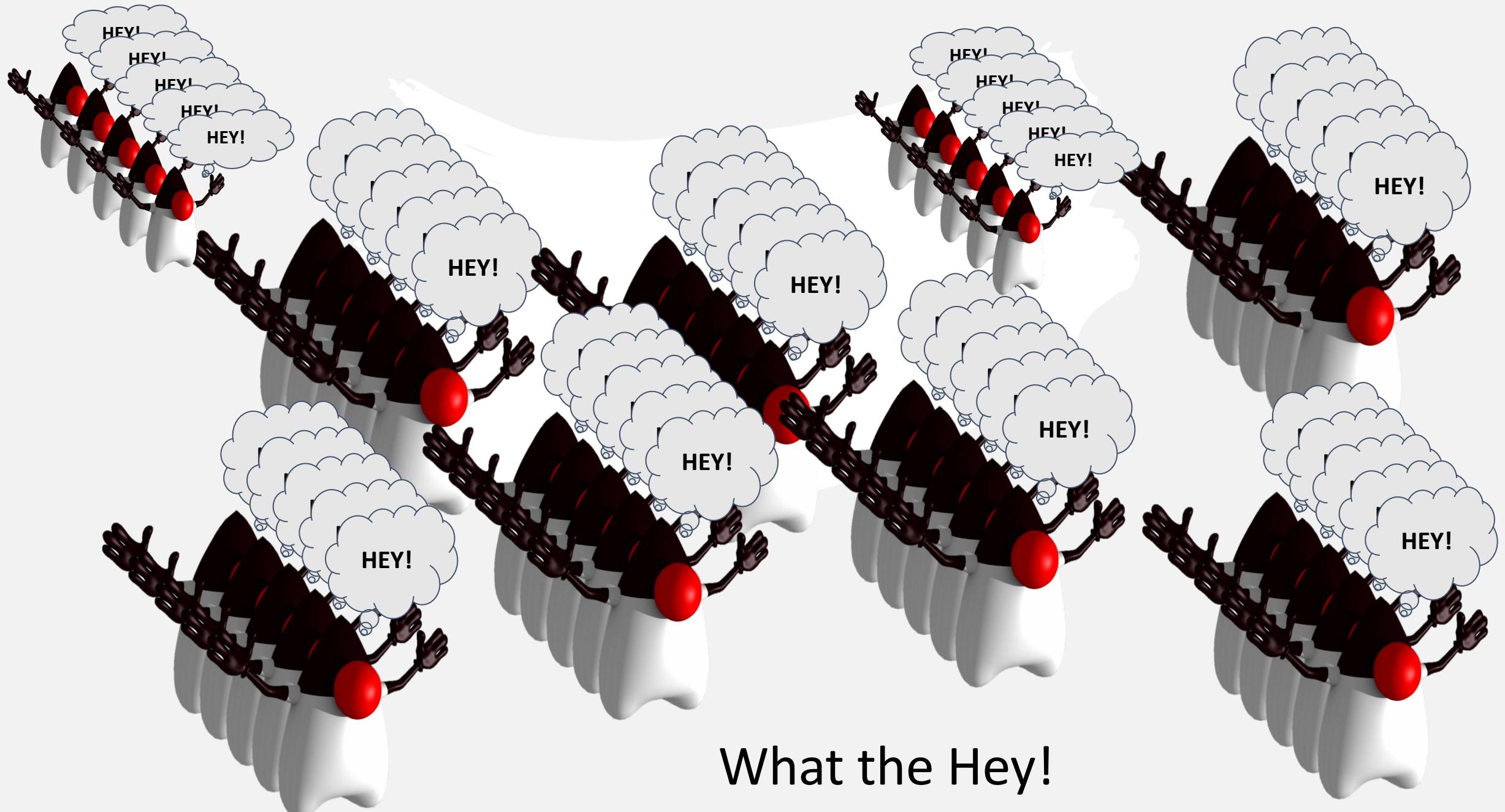


*You can write your Machine Learning app in
any language you want, as long as it's Python.*



You can write your Machine Learning app in any language you want, as long as it's Python.





What the Hey!

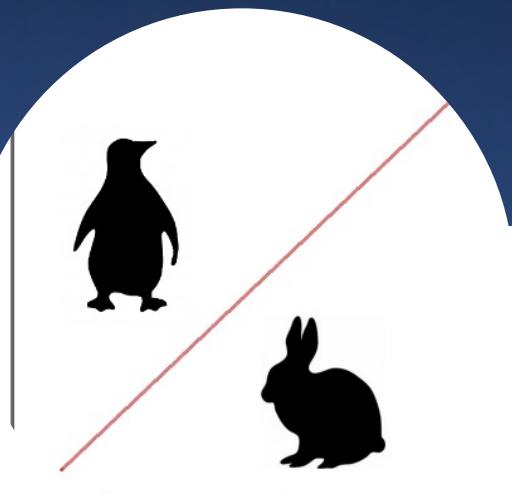
~12M Java Devs

JSR 381 - Visual Recognition API

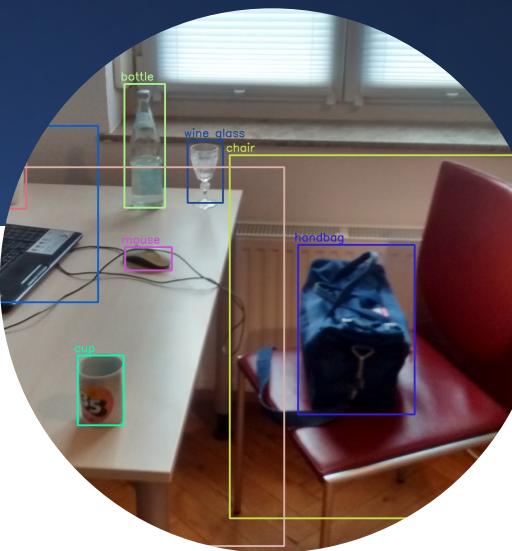
- Java-friendly standard API for computer vision tasks using ML
- Provides a generic ML API
- Designed for Java app devs
- Multiple implementations
- High level abstractions
- Readable and easy to use



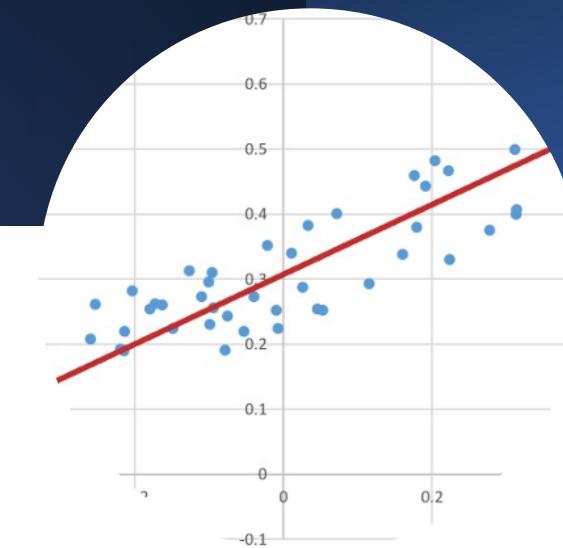
What Can you Do with It?



Classify images and
data/objects
Classification task /
differentiate between
categories

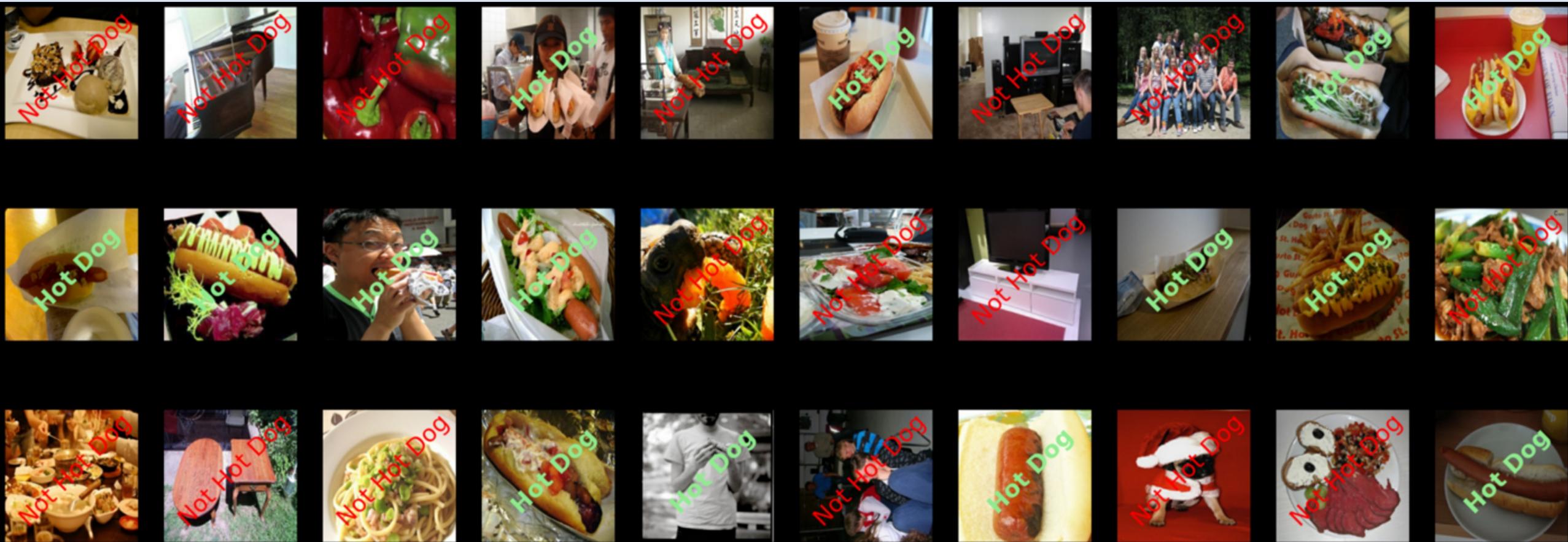


Object Detection
classification +
regression(position)



Estimate value
regression task

Hot Dog or Not Hot Dog



Scene from TV show Silicon Valley

<https://www.youtube.com/watch?v=vlci3C4JkL0>

A close-up photograph of a shiny blue alarm clock. The clock has two round bells on top and a white analog dial in the center. The numbers 11, 12, and 1 are clearly visible on the dial. The background is a solid light orange color.

Demo Time!

The future of AI/ML in Java

- Upcoming enhancements to the language will be significant for ML
- JEP 417: Vector API -
<https://openjdk.org/jeps/438>
- Project Valhalla – Value Objects
- Project Panama – Connecting Java to foreign (non-Java) libraries such as those written in C.
 - This will allow Java to use an AI/ML written in C/C++

/Reference Implementation



- Reference implementation of VisRec API is based on the Deep Netts Community Edition which is a Java based deep learning library provided by www.deepnetts.com

More info: <https://www.deepnetts.com/blog/deep-netts-community-edition>

- DeepNetts has released a community edition of their deep learning engine, and contributed their experience to this JSR as a part of their open-source strategy

/Additional Implementation

DeepJavaLibrary

- There is a second ML library that is compatible with JSR 381
- The AWS Deep Java Library or DJL
- Open-Source library from Amazon
- To learn more visit <https://github.com/deepjavalibrary/djl>
- JSR 381 DJL implementation
<https://github.com/JavaVisRec/visrec-djl>

JSR381 Information

JCP.org <https://jcp.org/en/jsr/detail?id=381>

JSR project on GitHub github.com/JavaVisRec

API github.com/JavaVisRec/visrec-api

RI github.com/JavaVisRec/visrec-ri

Examples github.com/JavaVisRec/jsr381-examples

Mailing list visrec@groups.io

Here is a list of image datasets:

- <http://vision.stanford.edu/aditya86/ImageNetDogs/>
- <https://stanforddaimi.azurewebsites.net/>
- <https://imerit.net/blog/22-free-image-datasets-for-computer-vision-all-pbm/>
- <https://datagen.tech/guides/image-datasets/image-datasets/>
- <https://hackernoon.com/top-20-image-datasets-for-machine-learning-and-computer-vision-rq3w3zxo>
- <https://storage.googleapis.com/openimages/web/index.html>
- <https://www.analyticsvidhya.com/blog/2018/03/comprehensive-collection-deep-learning-datasets/>