Enhance visitor experience and researcher productivity by leveraging machine intelligence

Stinger Inspector - Team UBS
February 2018

UBS

Enhancing Experience and Productivity

Goals:

- Find appealing stinger pictures to show visitors

- Scale manual researcher stinger classification to large number of pictures automatically

- Validate researcher classification for scientific accuracy

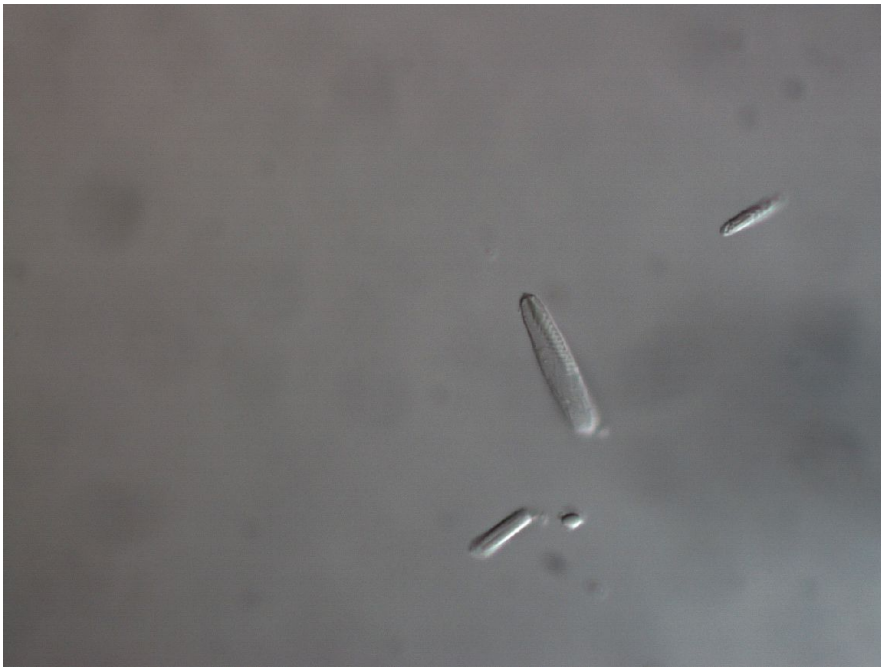- Find new categories of stingers for researcher and visitors to explore

Find Appealing Displays

Objective: find clean images for visitors to see core features clearly

Challenge: many pictures in many folders, which ones to pick

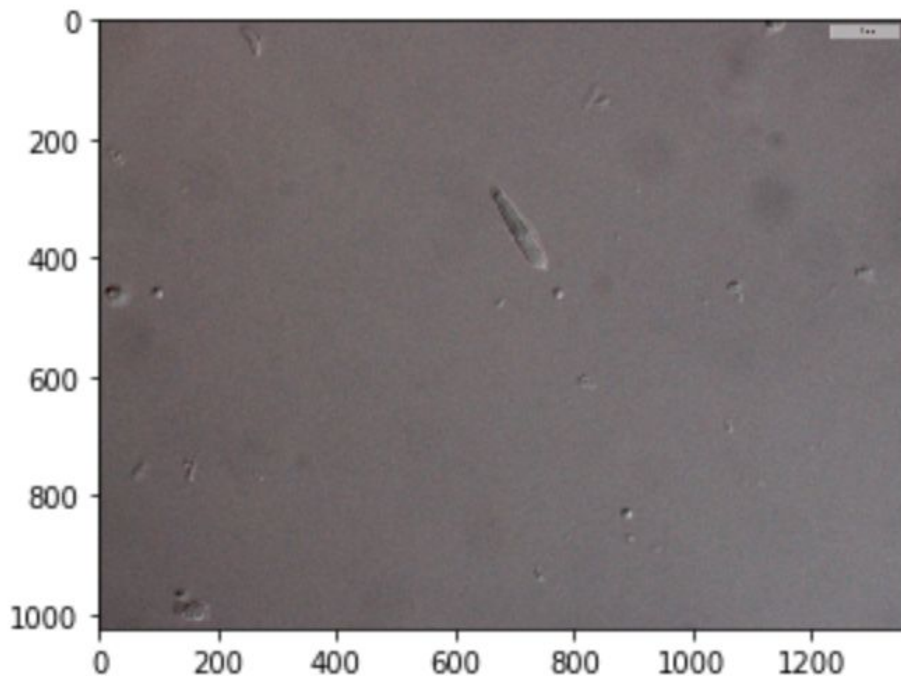**Solution**: scan through all folders find images with little absolute change

Clean	Noisy

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Scale manual researcher classification

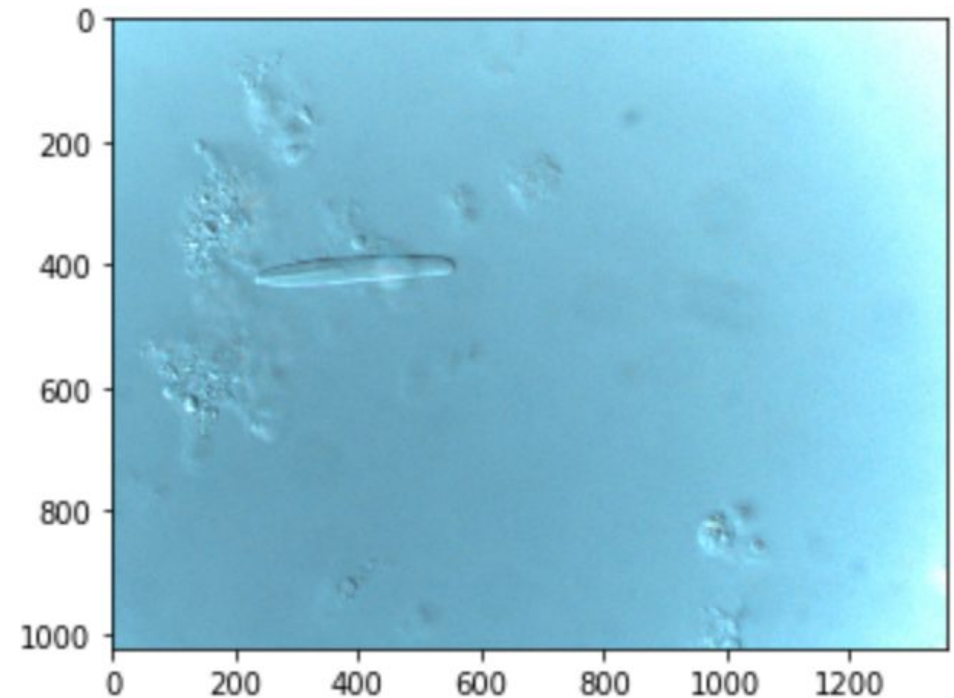**Objective:** automatically classify stinger types on unseen images

Challenge: many noisy pictures

Solution: train deep neutral networks, achieved 62% accuracy

Correct Type A

Correct Type B

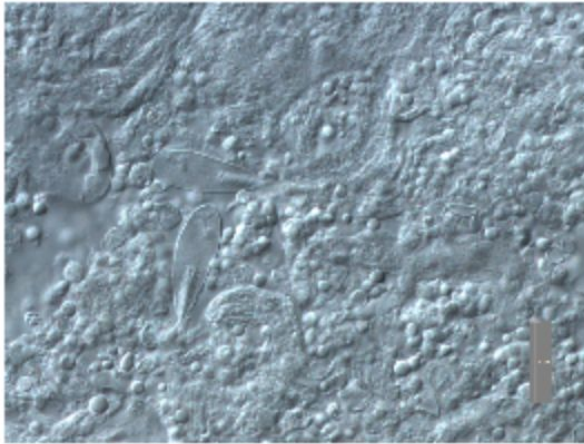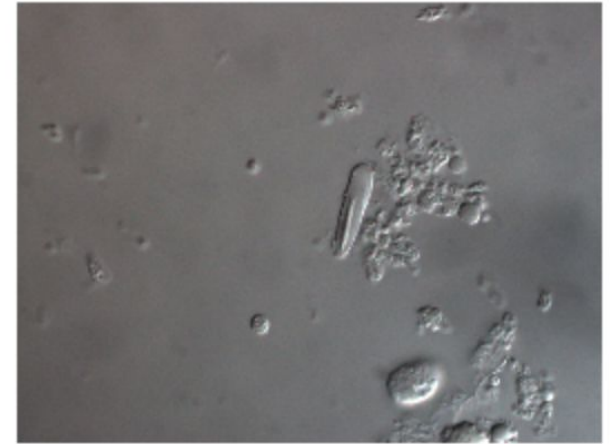# Model Training

```
In [60]: plot_val_with_title(most_by_correct(0, True), "Most correct typeA's")
```
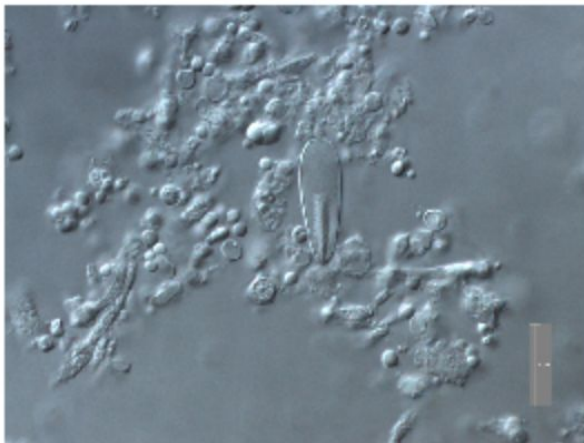
Most correct typeA's

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Model Training

```
In [61]: plot_val_with_title(most_by_correct(1, True), "Most correct typeB's")
```

Most correct typeB's

Model Training

```
In [58]:  plot_val_with_title(most_by_correct(0, False), "Most incorrect TypeAs")
```
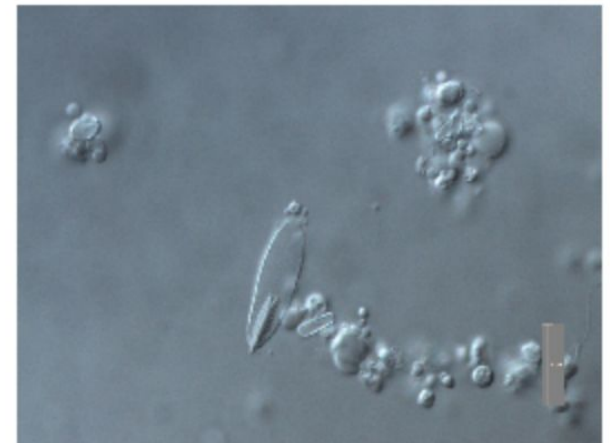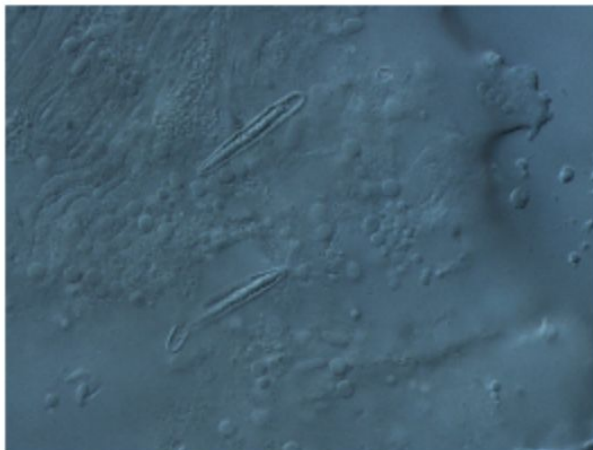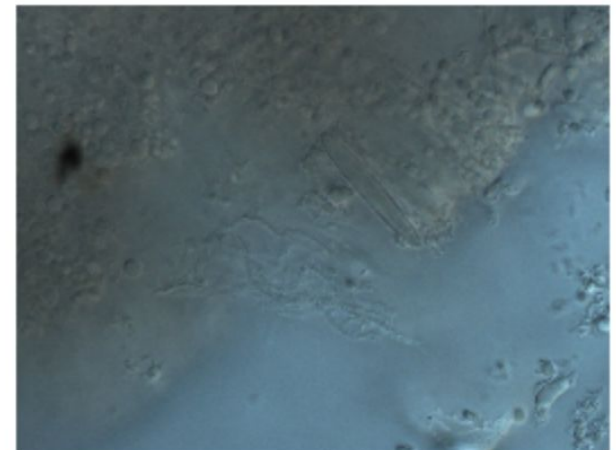
Most incorrect TypeAs

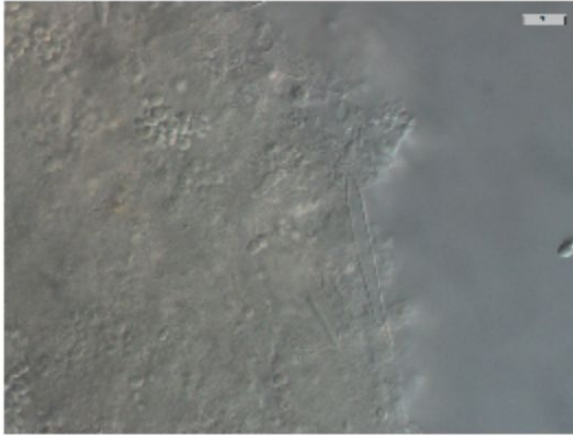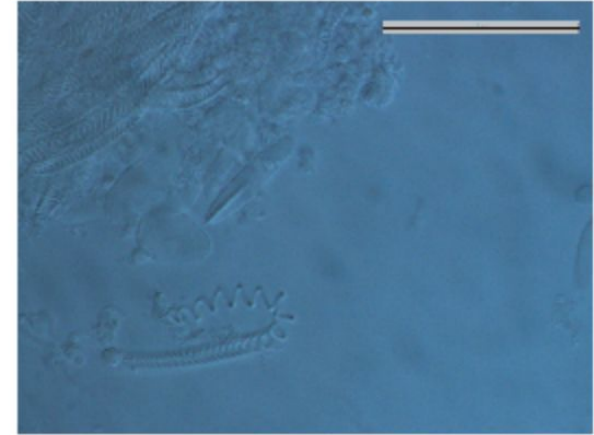# Model Training
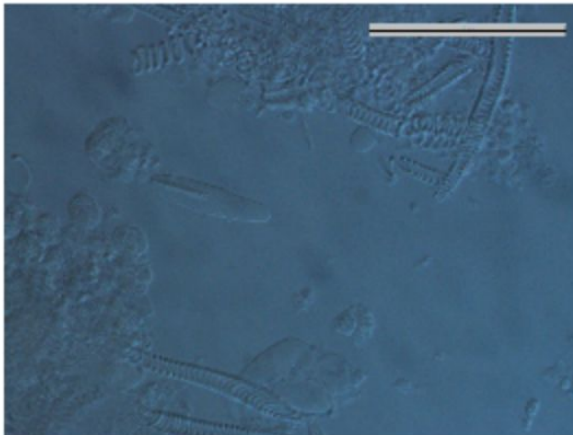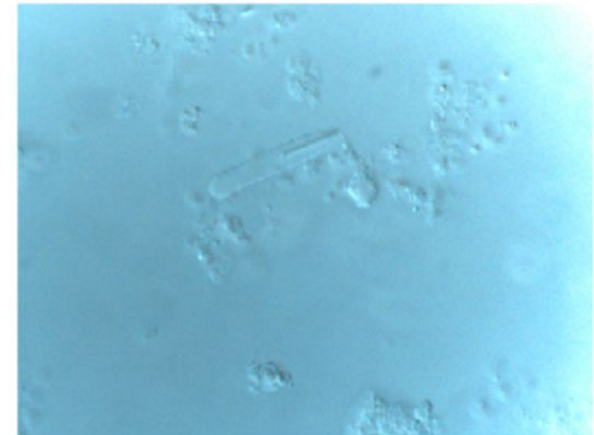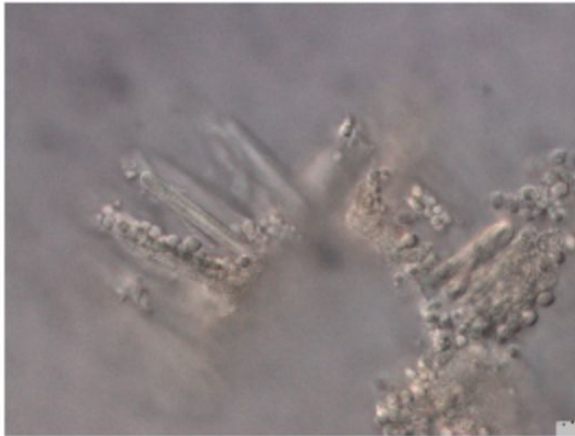
```
In [59]: plot_val_with_title(most_by_correct(1, False), "Most incorrect TypeBs")
```

Most incorrect TypeBs

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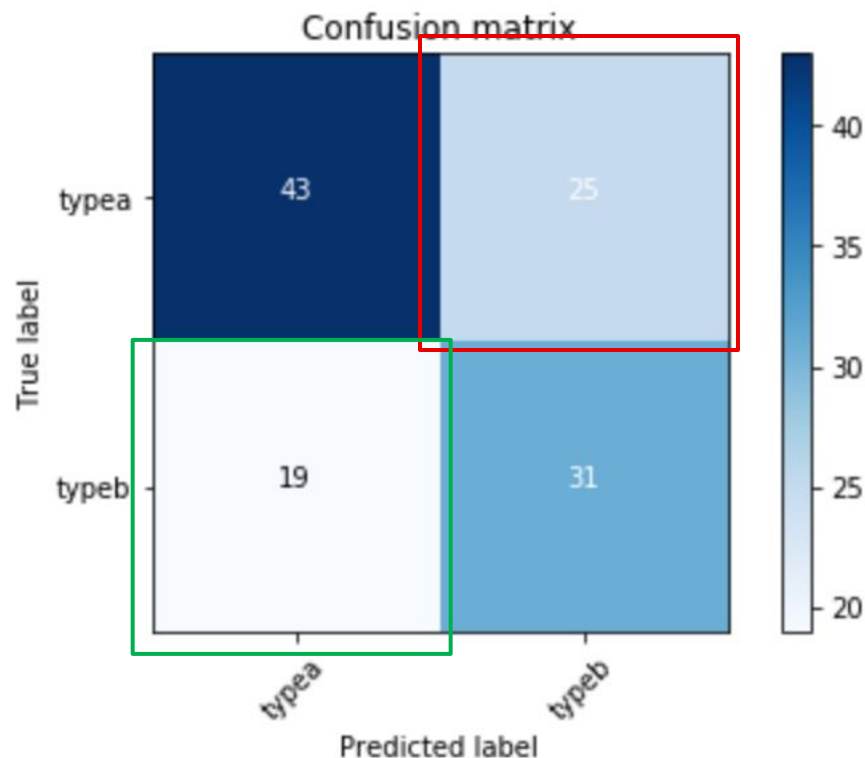
7
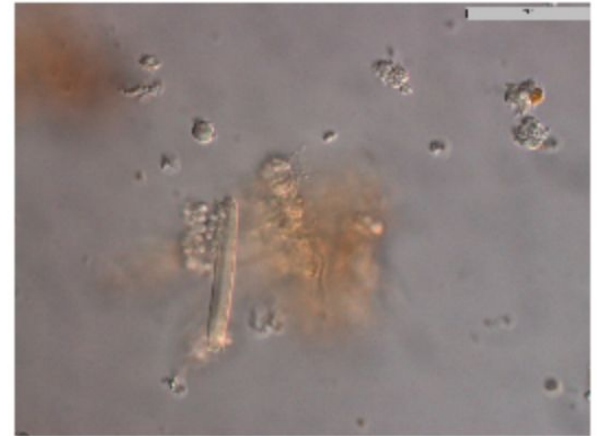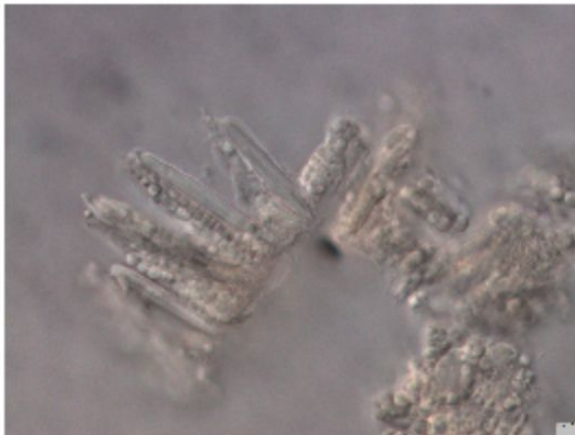
Validate Work / Find New Categories

Objective: did the researcher miss anything? Are there other categories?

Challenge: many stingers look similar to the human eye

Solution: identified cluster of stingers which get consistently misclassified

Confusion Matrix	Example

Our Workflow

Preparation
- Course.fast.ai
- Kaggle Right Whale Challenge

Preprocess
- Normalize,Transform
- Learning rate tuning

Model
- Convolutional Neural Network (CNN)
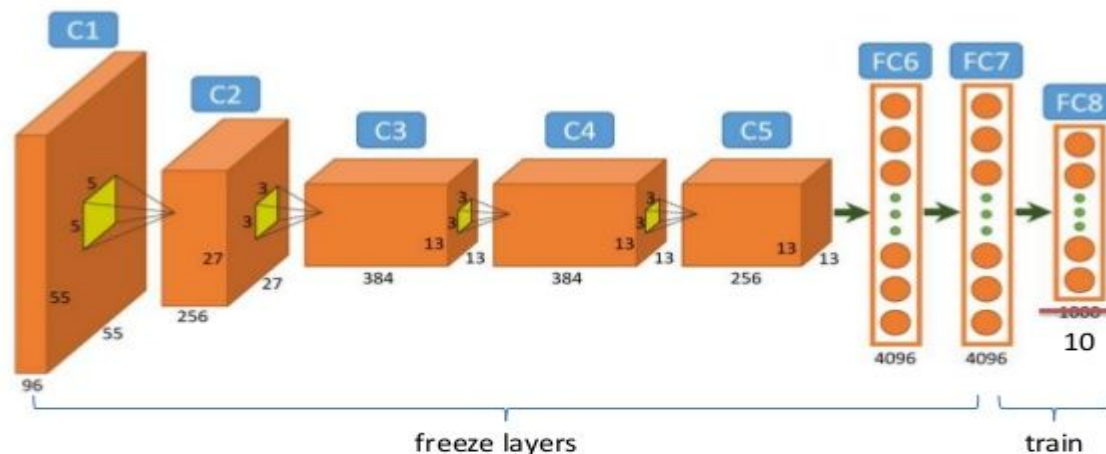- Modify pre-trained resnet34

Infra-structure
- Stack: Python PIL, CV2, pytorch, fastai
- Hardware: Paperspace cloud gpu

Our Learnings - What worked

- Pretrained deep CNN easily adopted for other purposes

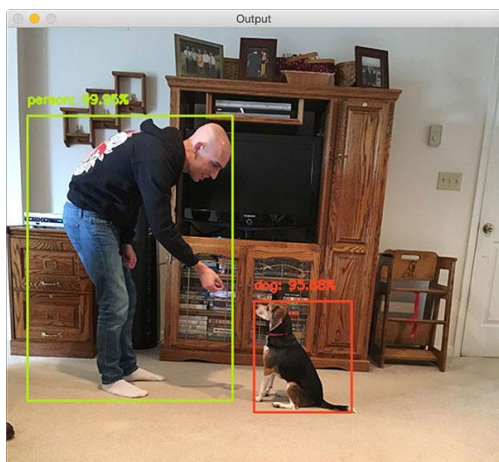- Image normalization, transformation and parameter tuning increased accuracy from 55% to 62%

Caffe

Fine-tuning Pretrained Network

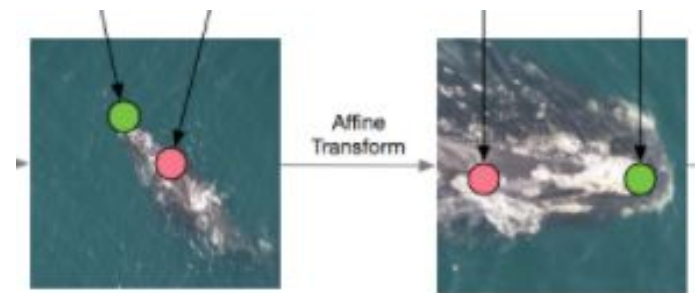**UBS**

Our Learnings - What didn't work (fast)

- Tried to leverage object detection but confused by different shapes and multiple objects

- Tried to leverage human drawn image focus but alignment areas shapes differ and multiple objects

Training auto
detection model

Training auto
crop model

Training auto
alignment model

Objectives Achieved?

√ **Find appealing pictures to display**

√ Scale manual researcher classification

√ **Validate researcher /** Find new categories

× **Auto detect**

× Auto crop

× Auto align