

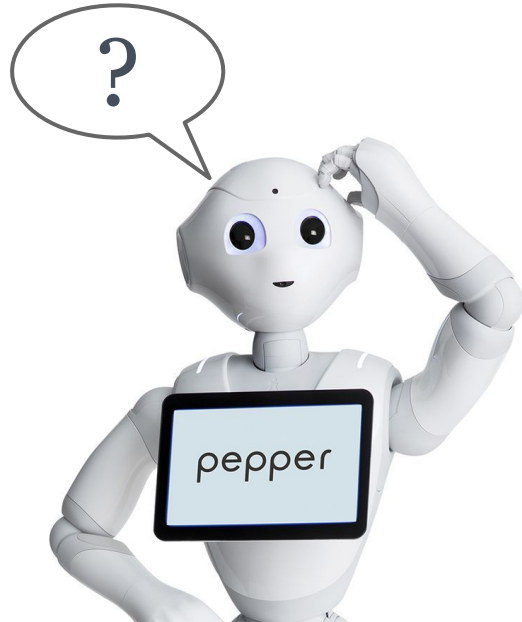
# Machine Learning Human Facial Expressions

Jessica Hudiono

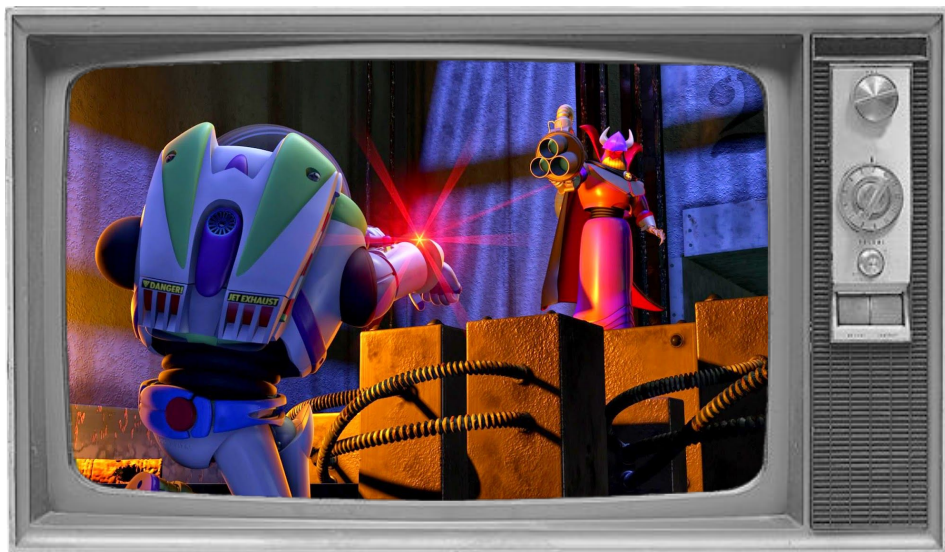
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# Human-Computer Interactions



# Example: Toy Story 5

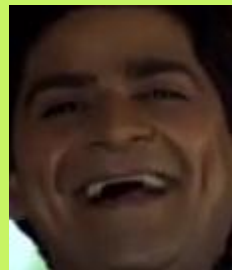


# Data: IMFDB

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- Indian movies
- Challenges
  - Ages
  - Positions
  - Lighting
  - Skin tones
  - Facial accessories

Happy - 50%

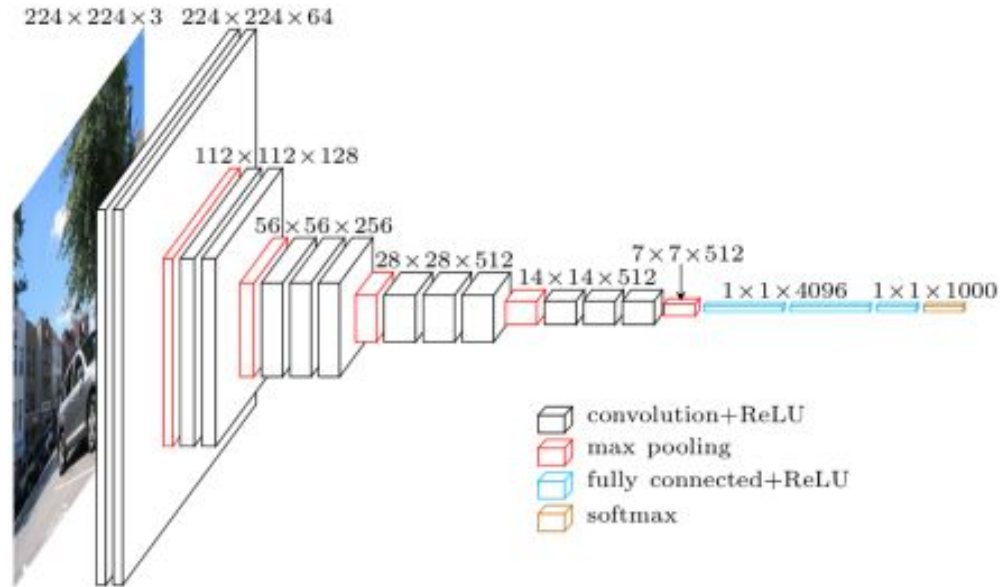


Not Happy - 50%



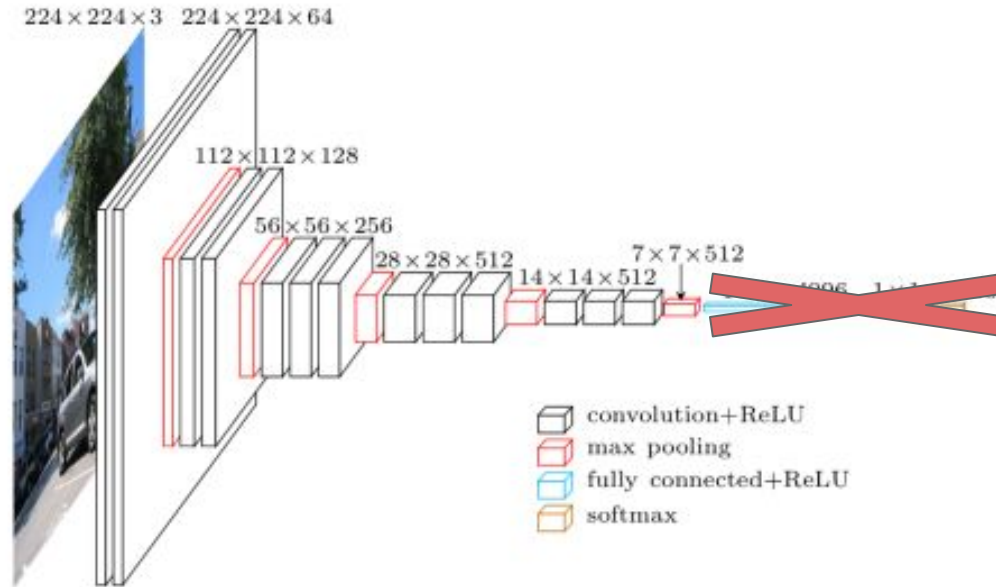
# Transfer Learning

VGG16 Machine Vision Network



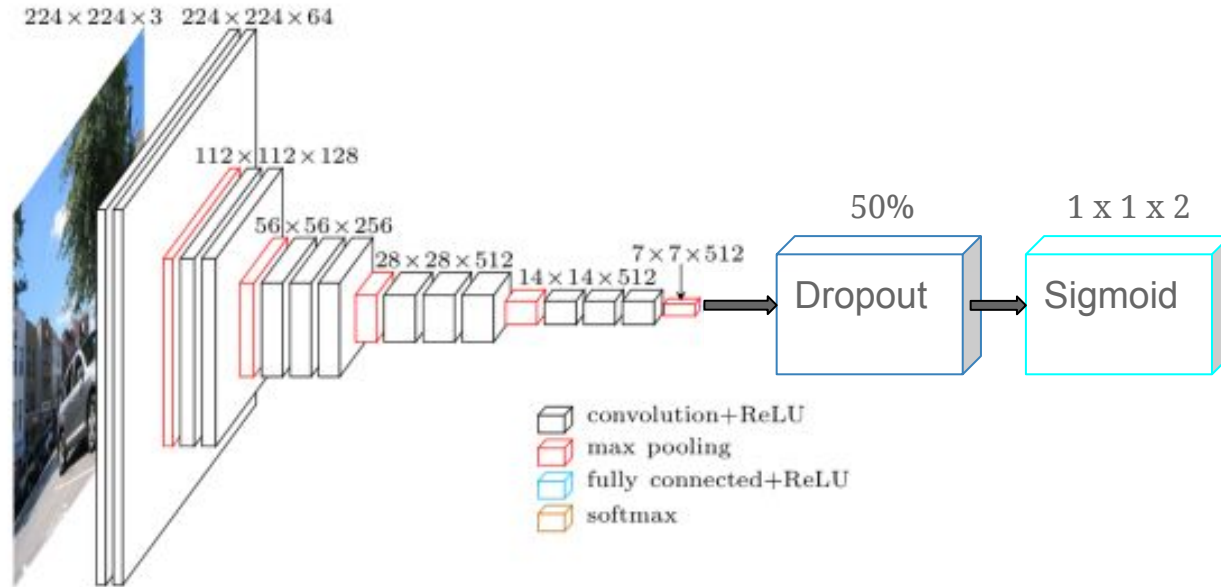
# Transfer Learning

VGG16 Machine Vision Network

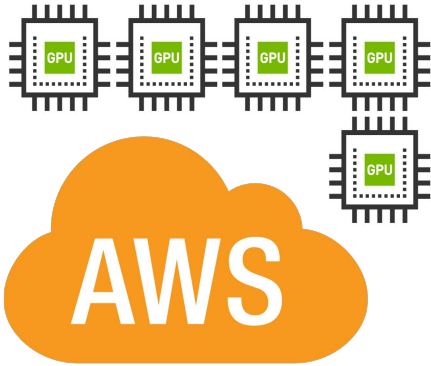


# Transfer Learning

VGG16 Machine Vision Network

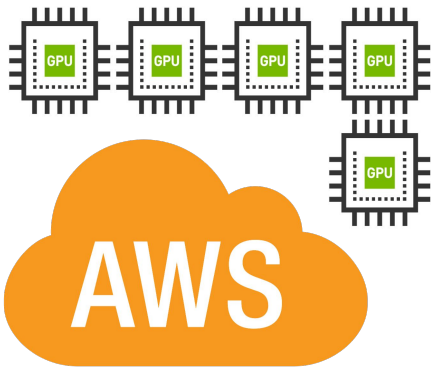


# Pipeline

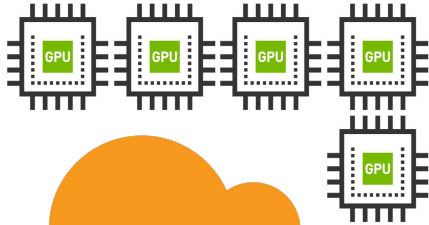




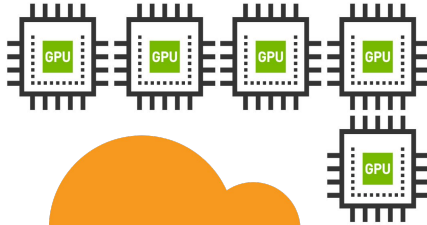
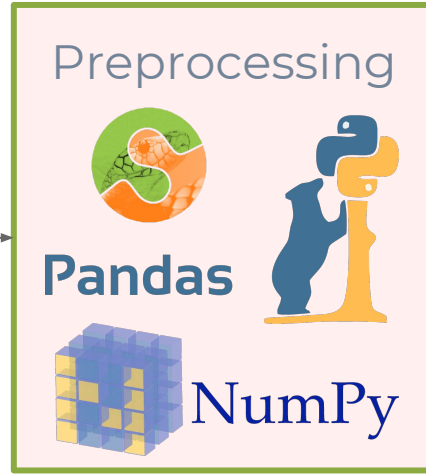
# Pipeline



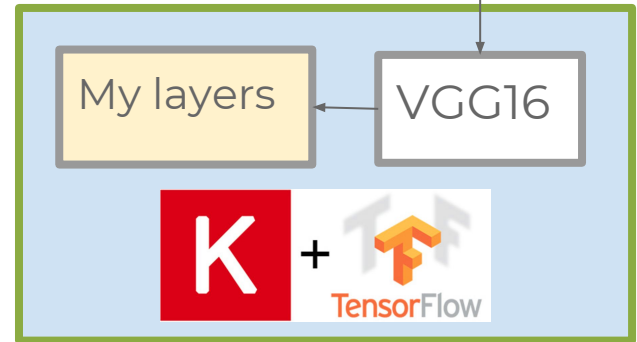
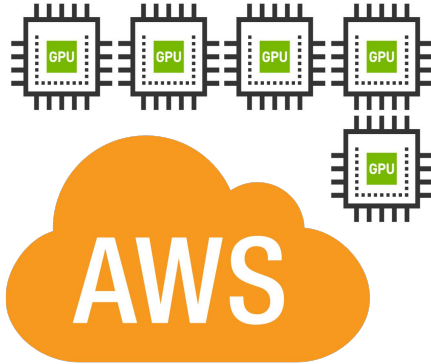
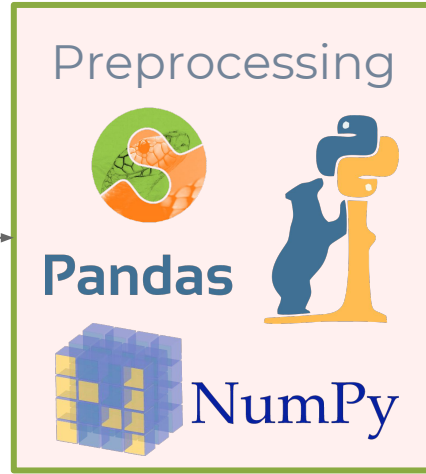
# Pipeline



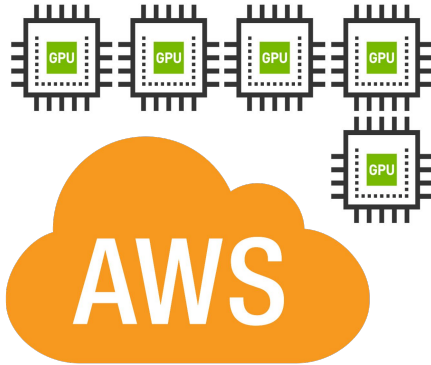
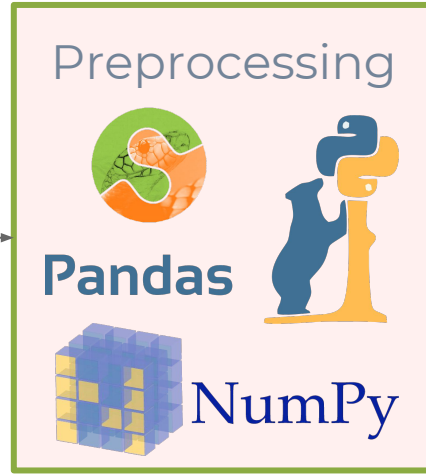
# Pipeline



# Pipeline

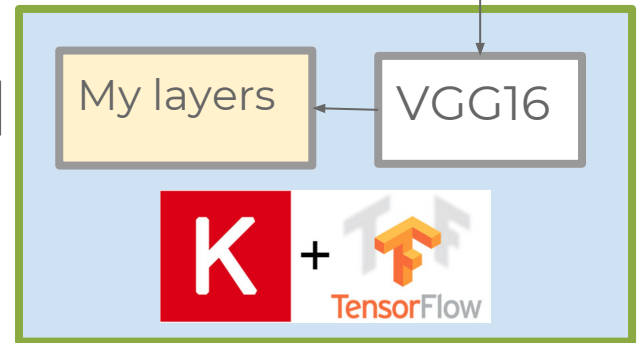


# Pipeline

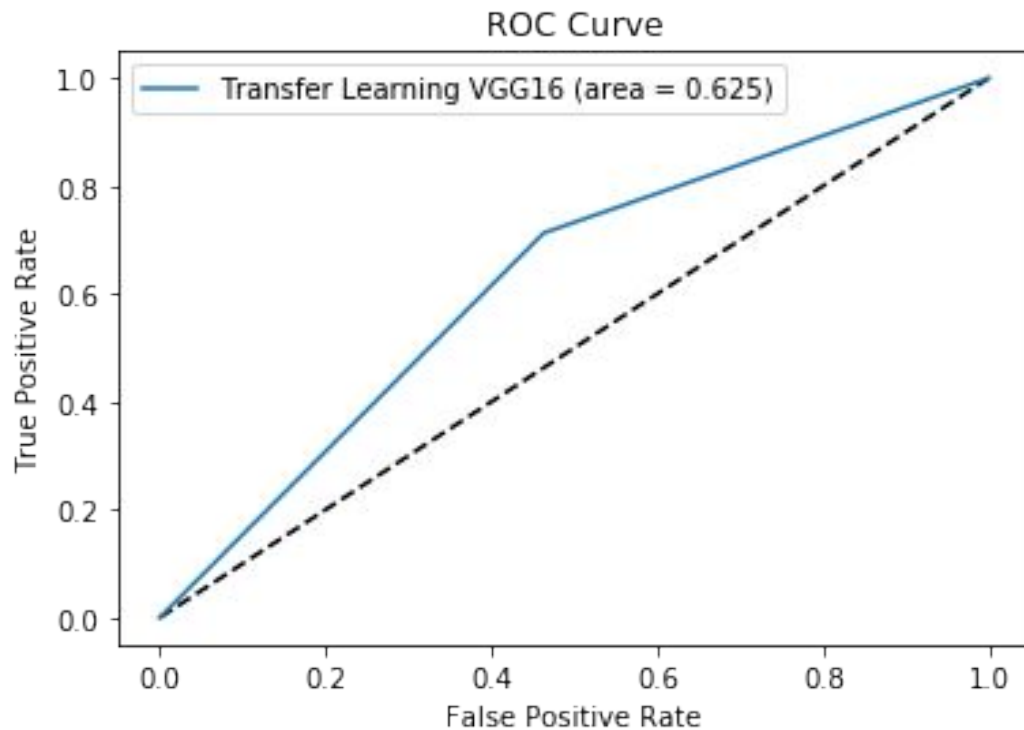


Prediction

	80%
	20%



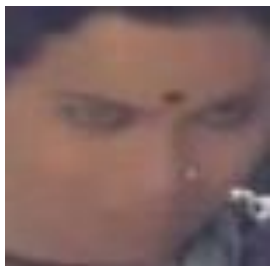
# Metrics



Accuracy	76.0%
Precision	76.0%
Recall	76.0%
ROC AUC	62.5%

# Difficult Images

---



# Future Work

---

- Improvements
  - Other architectures
  - Fine-tuning



# Future Work

---

- Improvements
  - Other architectures
  - Fine-tuning
- More capabilities
  - “Natural” scenes
  - Acting vs. real
  - Video



# Future Work

---

- Improvements
  - Other architectures
  - Fine-tuning
- More capabilities
  - “Natural” scenes
  - Acting vs. real
  - Video
- Beyond discrete categories?



# Thanks!



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**github.com/jhudiono**

**linkedin.com/in/jessica-hudiono-47b86920**

# Sources

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- IMFDB

- Shankar Setty, Moula Husain, Parisa Beham, Jyothi Gudavalli, Menaka Kandasamy, Radhesyam Vaddi, Vidyagouri Hemadri, J C Karure, Raja Raju, Rajan, Vijay Kumar and C V Jawahar. "Indian Movie Face Database: A Benchmark for Face Recognition Under Wide Variations". National Conference on Computer Vision, Pattern Recognition, Image Processing and Graphics (NCVPRIPG), 2013.

- VGG16

- [Karen Simonyan](#), [Andrew Zisserman](#), "Very Deep Convolutional Networks for Large-Scale Image Recognition," [arXiv:1409.1556v6](#) [cs.CV], Apr 2015
- <https://gist.github.com/baraldilorenzo/07d7802847aaad0a35d3>

# Tools/Process

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- Preprocessing

- pandas
- scikit-image
- numpy

- Modeling

- scikit-learn
- Keras on Tensorflow
- VGG16

- Archival

- h5py
- Keras models

- Cloud

- EC2: p2.8xlarge + Ubuntu Deep Learning AMI
- Filezilla

# Other Challenges

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- Hand cleaning poorly labeled data
- GPU required
- Neural network opacity
- Other features not represented in data--Cultural differences? Situational context?

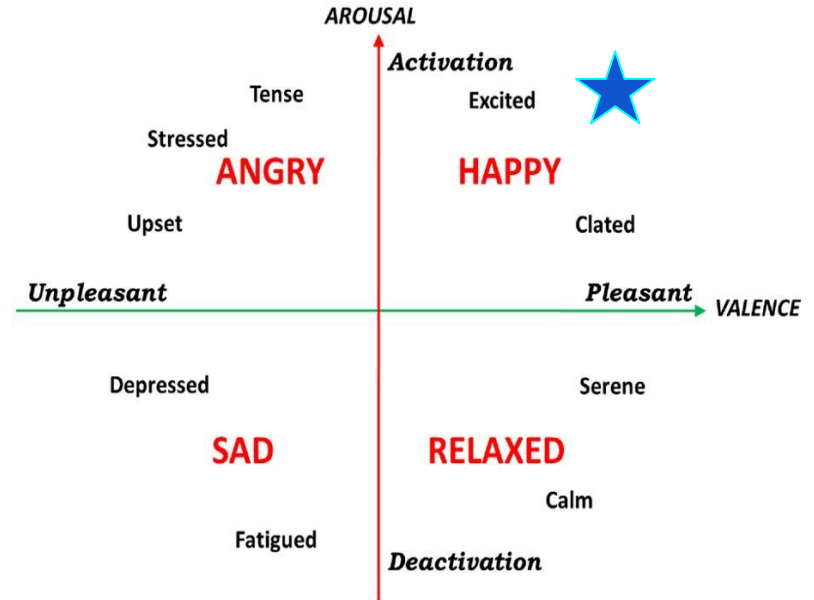
# Labeling Emotions

## Categorical (FACS)

Happy	.71
Surprise	.25
Anger	.01
Sad	.01
Fear	.01
Disgust	.01



## Dimensional (Circumplex model)



# Model Parameters

---

- VGG16
  - weights = imagenet
- Custom top layers
  - dropout = 0.5
  - optimizer = adam
  - loss = binary cross entropy
- Training
  - epochs = 20



# Image Augmentation

---

- Original dataset very imbalanced
- Picked at several seed images from each class
- Applied random transformations for new images
- Used as validation data

# Metrics (different datasets)

