

# Deep Learning Identification of Black Natural Hairstyles

Princess Sampson, Depts. of CS and CWS  
Advised by Dr. Erdi Kara, Dept. of Math  
Spelman College Research Day 2022

*This work is supported by the CODE Scholars  
program.*



# Overview

1. Motivation
2. Data & Classes
3. Tools & Methods
4. Results

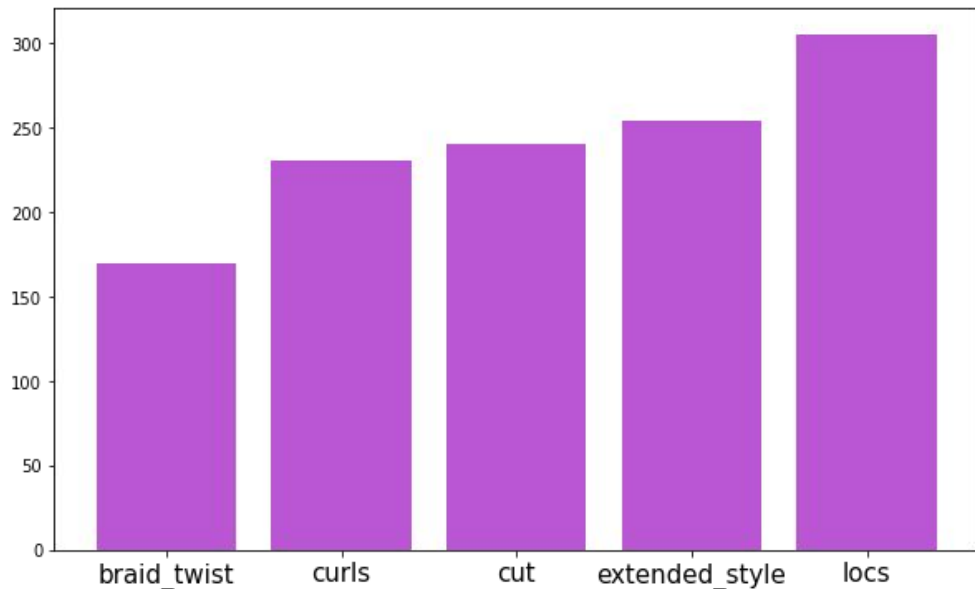
PYTORCH

# Motivation



- Research topics motivated by Black culture are not prevalent in machine learning applications.
- **The goal:** classifying images of Black women's natural hairstyles utilizing machine learning.

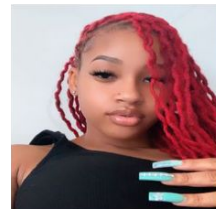
# Data & Classes



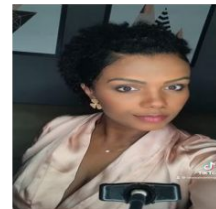
curls



locs



cut



cut



cut



extended\_style



curls



braid\_twist



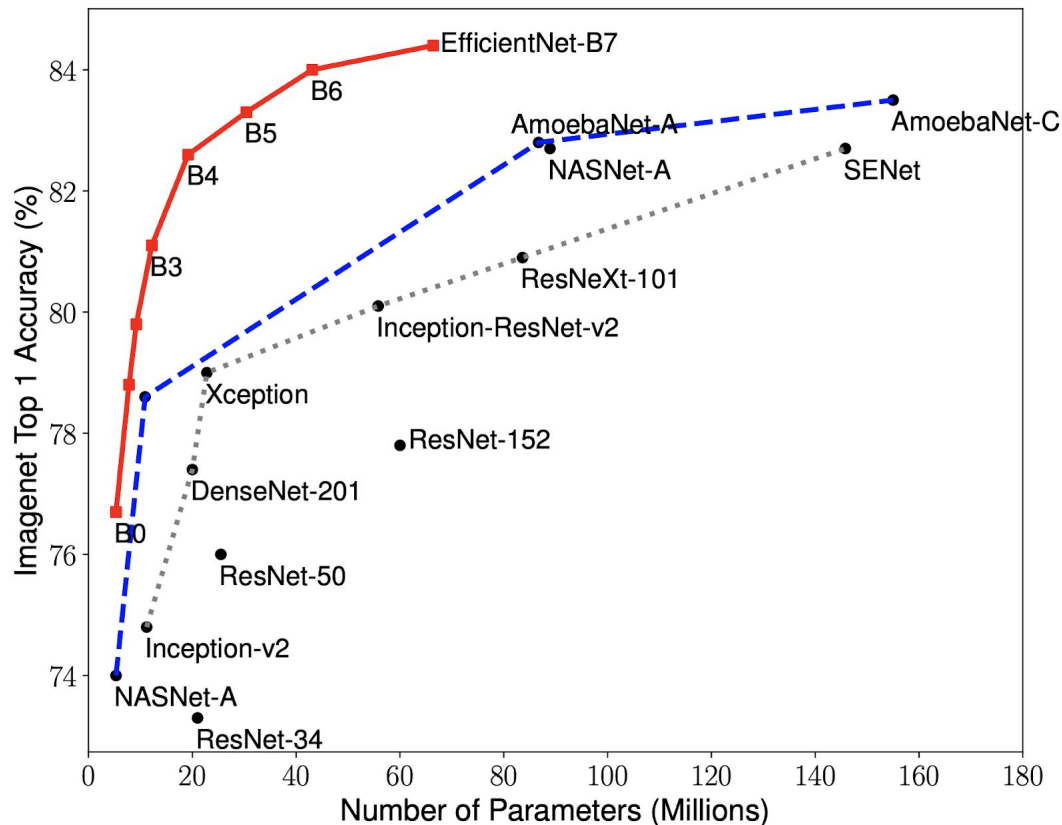
braid\_twist



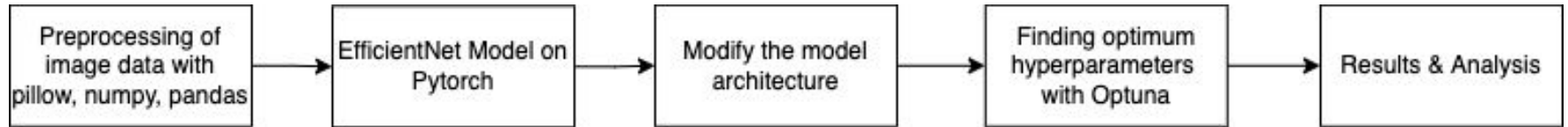
# Transfer Learning



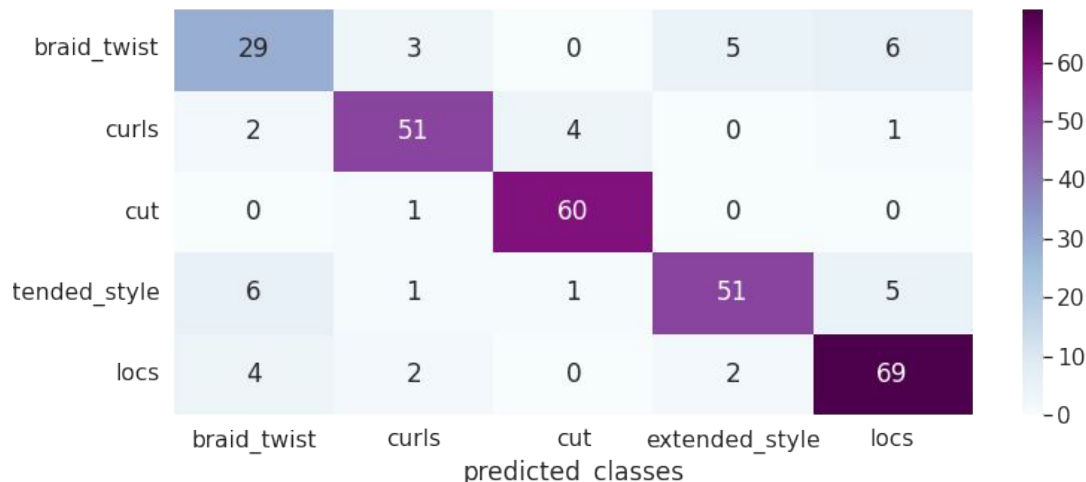
- Training and developing models from scratch per domain is inefficient and difficult for a small group of researches
- Efficient Net: State of the art neural network architecture developed by Google
- Higher accuracy with fewer parameters
- Trained on **1.2 million images** to identify 1000 classes



# Transfer Learning Pipeline

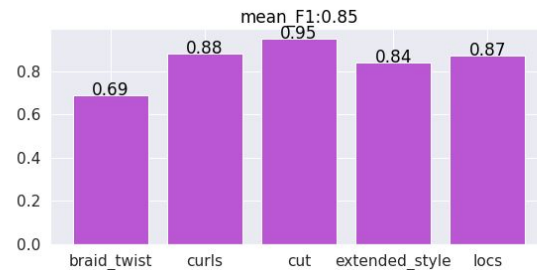
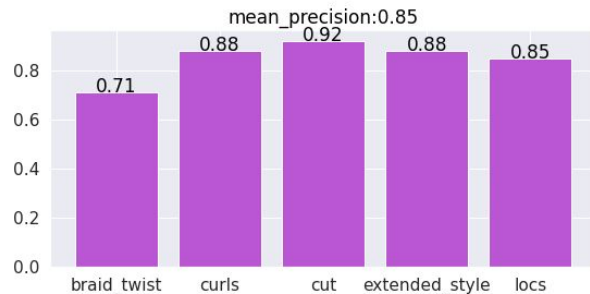
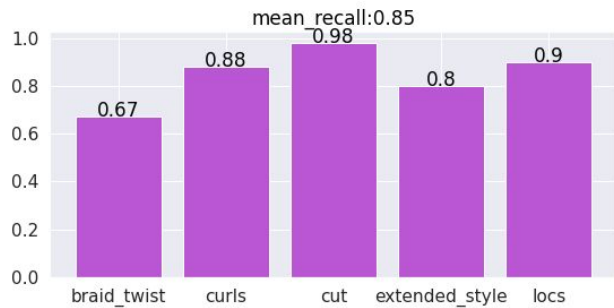


# Results/Confusion Matrix



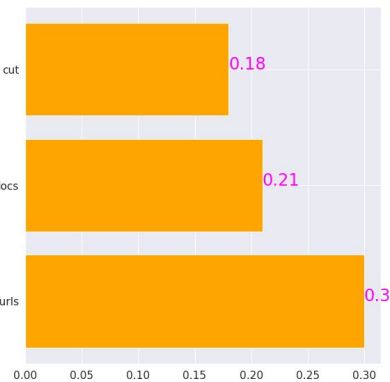
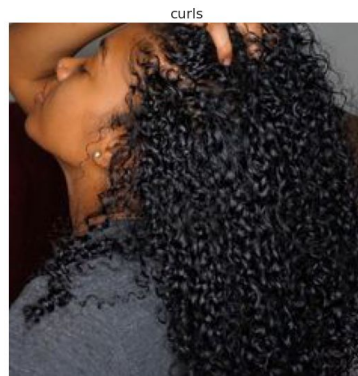
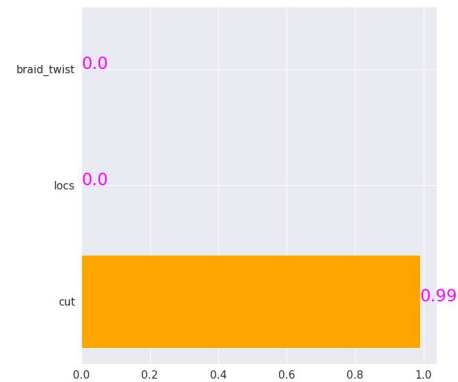
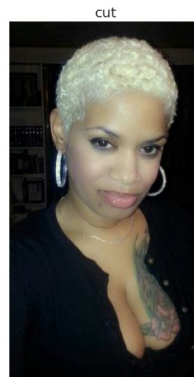
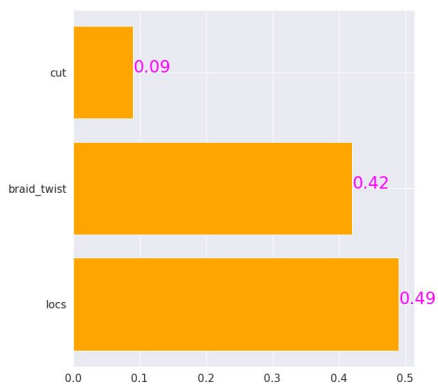
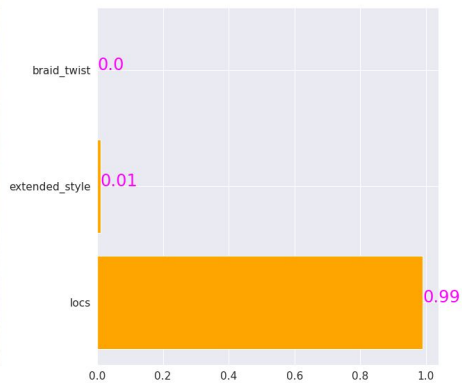
Overall accuracy: 86%  
Top 2 accuracy: 95%  
Mean recall: 85%  
Mean precision: 85%  
Mean F1 score: 85%

# Results: Recall, Precision, F1 Scores

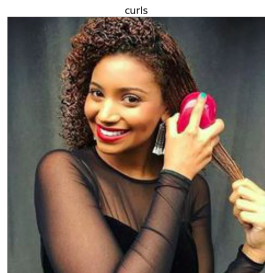




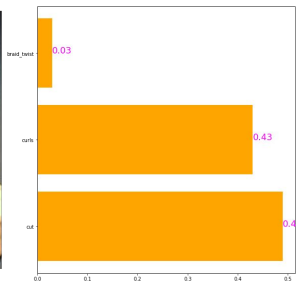
# Predictions



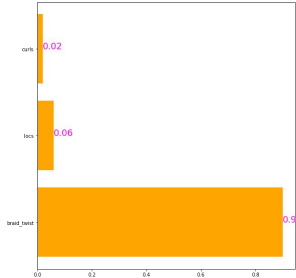
# Misclassified Images



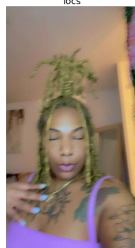
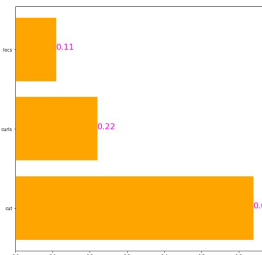
curls



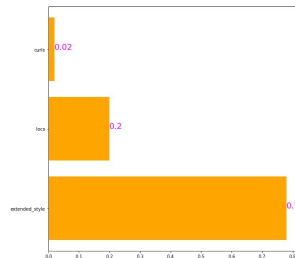
curls



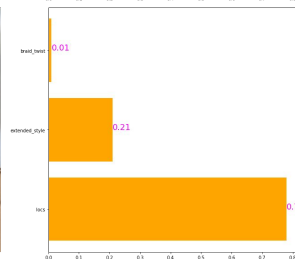
curls



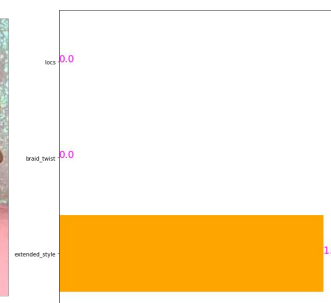
locs



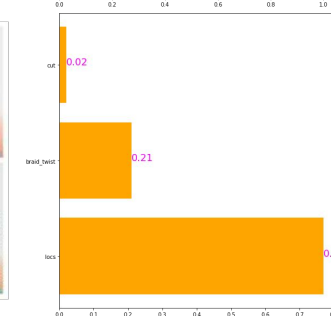
extended\_style



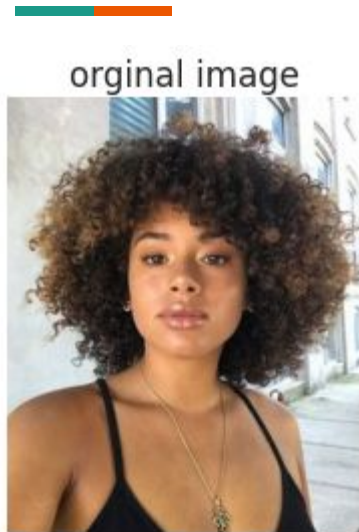
braid\_twist



braid\_twist



# How Computers See





## Limitations & Ethical Implications

- There are far more than five classes of natural hairstyles
- The data is of individuals generally identified as feminine, based on stereotypical gender norms
- This is quite an effective and powerful model — but systems that can identify aspects of Blackness can often be utilized for harm via surveillance and policing
- Is identifying these hairstyles a dominant paradigm — is the point to learn what these are as an outsider to the culture, or possibly utilize this information for resources and suggestions to expand your own expression?

# Acknowledgements 🥰

---

- As an incoming Computer Science PhD student and the University of Pennsylvania, this project exposed me to advanced applied machine learnings methods relevant to my interests in machine learning and culturally informed computing
- Thank you to Dr. Erdi Kara for his patience and enthusiasm, as well as the larger CODE Scholars program
- Happy research day!



# Questions?