# Machine Learning In The Navajo Nation

# Introduction

**Impact of Native American Jewelry forgeries.**

- Millions of dollars worth of fakes have been distributed.

- Fakes cast doubt on the authenticity of real Native made jewelry.

- Revenue lost for Native jewelers.
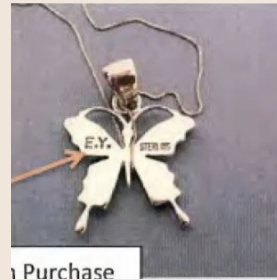
- Major cultural appropriation

# Interesting facts

**Recent forgery rings have been shutdown :**

- Operation Al-Zuni – which spanned 9 yrs. seized 350000 pieces of counterfeit jewelry. The estimated value of the jewelry was around $35 million dollars.

- Another operation, which spanned 5 yrs., shutdown another forgery ring who's trade value reached nearly $12 million.

- Native American jewelers have lost access to millions of dollars.

# Native American jewelry forgeries



**Fake Native American jewelry being made in a foreign sweat shop.**



**Forged Edison Yazzie jewelry**



**Real Edison Yazzie jewelry**

Inside a multimillion-dollar, counterfeit Native American art syndicate [Online images]. (2021). Jewelry. https://www.krqe.com

# Using machine learning to spot fake Native American jewelry

**How can we use machine learning to help with determining forgeries. One of the applications of machine learning is image recognition:**

- Train a model to determine between fakes and real Native jewelry.

- Implementing that model onto a phone.

- Being able to use your phone to take pictures of jewelry to determine the provenance of suspected jewelry.

# Machine Learning in the Navajo Nation

Machine learning can be helpful in 'spotting' fake Native American jewelry and ensuring that people are buying authentic Native American made jewelry, which protects both the jeweler and the buyer.

# Edge Impulse

**Using Edge Impulse, I was able to train a model using pictures of a turquoise ring and comparing those to other rings.**

**With a relatively small dataset for training, the machine learning model gave some good results with identifying a specific ring.**



Roy Rafael / **Native Jewelry Detection**
This is your Edge Impulse project. From here you acquire new training data, design impulses and train models

Creating your first impulse (100% complete)

**Acquire data**
Every Machine Learning project starts with data. You can capture data from a development board or your phone, or import data you already collected.

LET'S COLLECT SOME DATA

**Design an impulse**
Teach the model to interpret previously unseen data, based on historical data. Use this to categorize new data, or to find anomalies in sensor readings.

GETTING STARTED: CONTINUOUS MOTION RECOGNITION

GETTING STARTED: RESPONDING TO YOUR VOICE
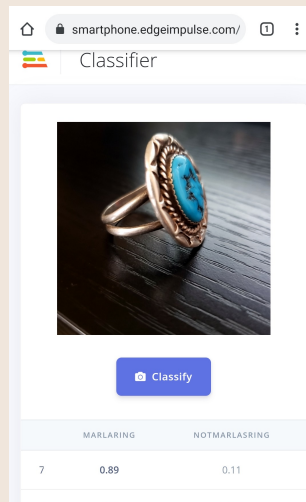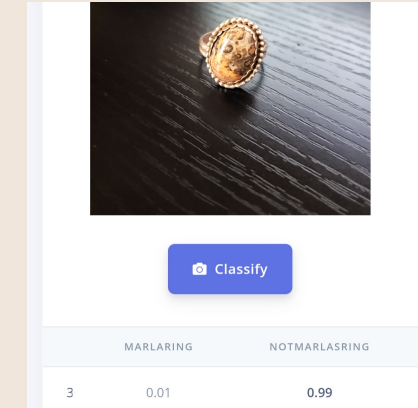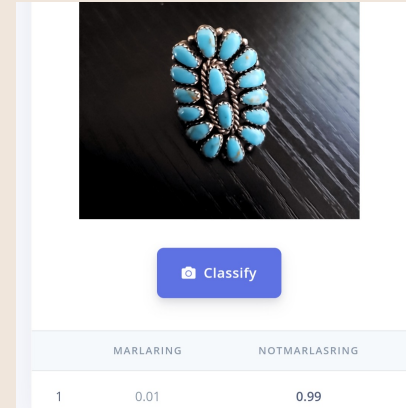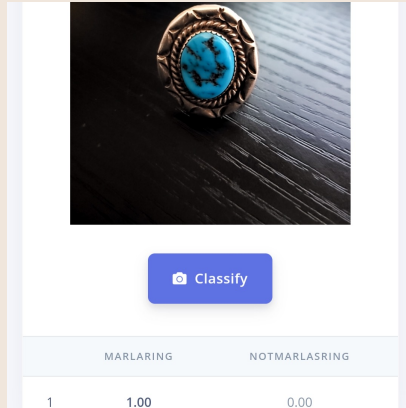
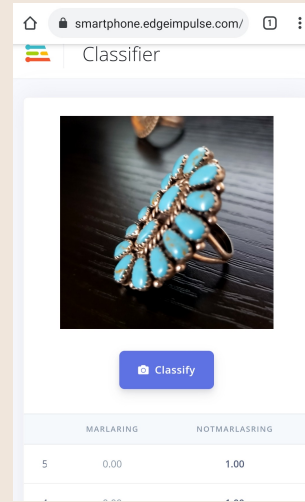GETTING STARTED: ADDING SIGHT TO YOUR SENSORS

**Deploy**
Package the complete impulse up, from signal processing code to trained model, and deploy it on your device. This ensures that the impulse runs with low latency and without requiring a network connection.
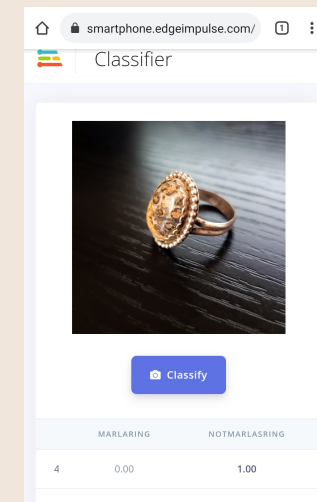
DEPLOY YOUR MODEL

# Results of Native Jewelry



| MARLARING | NOTMARLASRING |
|---|---|
| 1 | 1.00 | 0.00 |



| MARLARING | NOTMARLASRING |
|---|---|
| 1 | 0.01 | 0.99 |



| MARLARING | NOTMARLASRING |
|---|---|
| 3 | 0.01 | 0.99 |



smartphone.edgeimpulse.com/

Classifier

| MARLARING | NOTMARLASRING |
|---|---|
| 7 | 0.89 | 0.11 |



smartphone.edgeimpulse.com/

Classifier

| MARLARING | NOTMARLASRING |
|---|---|
| 5 | 0.00 | 1.00 |



smartphone.edgeimpulse.com/

Classifier

| MARLARING | NOTMARLASRING |
|---|---|
| 4 | 0.00 | 1.00 |

Results for Marla's Ring

Results for 1st test ring

Results for 2nd test ring

# Resources

**List of resources:**

- Baker, L. (2021, May 11). *Inside a multimillion-dollar, counterfeit Native American art syndicate.* KRQE. https://www.krqe.com/

- Boyd, K. (2019, February 8). *World's Largest Native American Art Forgery Ring Distributed $12M of Fakes.* Hyperallergic. https://hyperallergic.com/