



Identifying Glass Types

Understanding the composition of glass samples.

Could be crucial for criminal investigations.

Investigating new methods for glass production to reduce cost and increase efficiency.

The Features

Refractive Index

RI is a measure of how much a beam of light is bent when it enters a material.

Sodium (Na)

Na is typically used in the production of glass to help it resist breaking under stress.

Magnesium (Mg)

Mg is used in glass production to adjust the thermal expansion coefficient.

Aluminum (Al)

Al is a common ingredient in many types of glass.

Silicon (Si)

Si is the most abundant element in the Earth's crust and is used in the production of glass.

Potassium (K)

K is used in the production of glass to lower the melting temperature.

Calcium (Ca)

Ca is used in glass production to improve its chemical durability.

Barium (Ba)

Ba is used in the production of some types of glass, including optical and electronic glass.

Iron (Fe)

Fe is a common impurity in glass and can affect its color.

Glass Types

1 Building Windows - Float Processed

This type of glass is made by floating molten glass on a bed of molten metal. It is used mainly in high-rise buildings.

2 Building Windows - Non-Float Processed

This type of glass is made using the traditional process of blowing and casting. It is typically used in low-rise buildings.

3 Vehicle Windows - Float Processed

This type of glass is made using the float process and is used in the manufacture of car windows.

4 Containers

This type of glass is used for everything from drinking glasses to wine bottles. It is made using blown or pressed processes.

5 Tableware

This type of glass is used for serving dishes, vases, and other decorative items. It is made using blown or pressed processes.

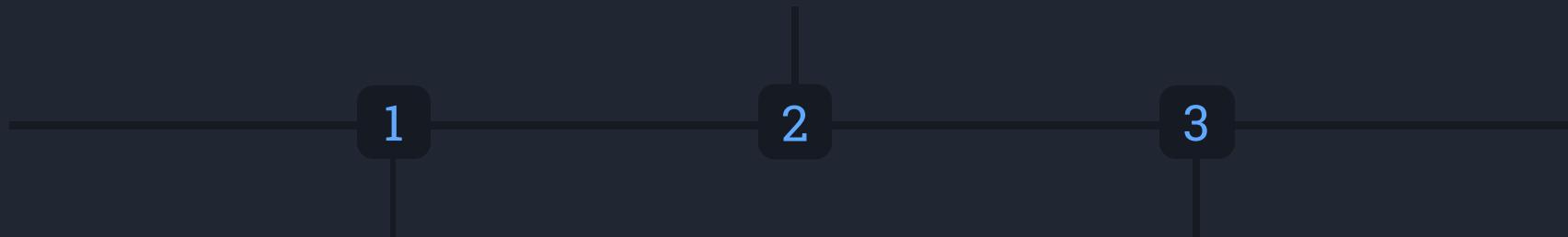
6 Headlamps

This type of glass is used in the manufacture of car headlights.

Workflow

Data Preprocessing

We cleaned and filtered the data to ensure its accuracy and ease of use.



Data Collection

We collected glass samples from various sources and measured the attributes.

Model Training

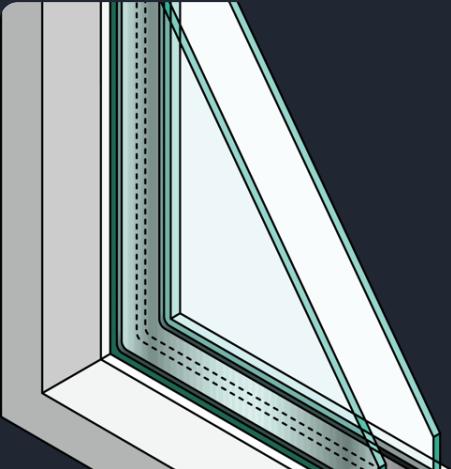
We tested three models and to see which one is the most effective.

A large, abstract image at the top of the slide features a dark blue background with a prominent, jagged, translucent white shape resembling a mountain or ice formation. The shape has sharp, irregular edges and some internal texture, set against a lighter blue gradient.

Data Imbalancing problems

- Missing one type of glass in data (type 4)
- Large difference in sample sizes between classes
- Comparison between performing a model with balanced or inbalanced data

The Best Model



Random Forest

Kappa score

- With imbalanced data: **0.785**
- With balanced data: 0.756



Gradient Boosting
Classifier

Kappa score

- With imbalanced data: 0.714
- With balanced data: 0.658

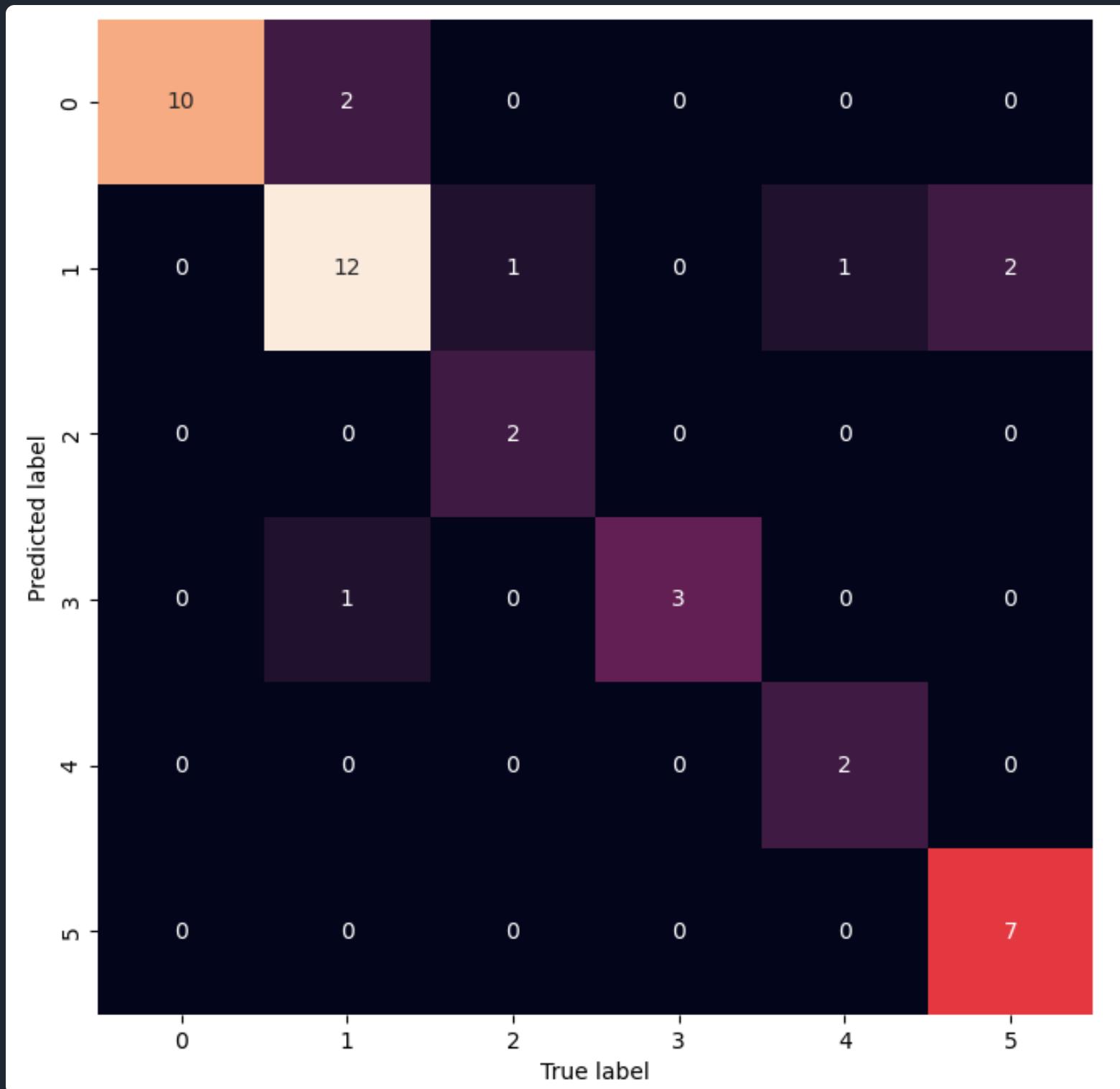


K-Nearest Neighbours

Kappa score

- With imbalanced data: 0.534
- With balanced data: 0.664

Confussion matrix



Only the 16% of the data won't be good predicted

Future Research

1 Nanoparticles

Researchers are exploring the possibilities of using nanoparticles to improve the strength and durability of glass.

2

New Glass Compositions

Developing new types of glass with specific properties for different applications.

3 Making Glass Cheaper

Investigating new methods for glass production to reduce cost and increase efficiency.

