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|  | **MSc. Data Science****Coventry University, UK** |  |
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|  | **Coursework** **ARTIFICIAL NEURAL NETWOKS** |  |
|  | —M.D.P. Wijesuriya Student ID (Coventry Uni.): 15764609  Student ID (NIBM): comscds241p-002  2024 Batch — |  |

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| Feature | Description | Typical Relevance in Cinnamon Quality |
| Moisture (%) | Percentage of water content in the cinnamon sample. | High moisture can lead to spoilage or fungal growth; ideal moisture is below 12% for quality cinnamon. |
| Ash (%) | Represents the total mineral content after combustion. | Excessive ash may indicate contamination or poor processing; good quality is below 5%. |
| Volatile Oil (%) | Percentage of volatile essential oils in the cinnamon. | Key indicator of aroma and flavor strength; 1–2.5% is typical for high-quality Ceylon cinnamon. |
| Acid Insoluble Ash (%) | Mineral residue insoluble in acid. | Higher levels suggest adulteration with soil, sand, or foreign particles; ideally be <1%. |
| Chromium (mg/kg) | Amount of chromium metal present. | Chromium is generally undesirable; safe and typical levels are very low (<0.5 mg/kg) in authentic Ceylon cinnamon. |
| Coumarin (mg/kg) | Concentration of coumarin, a natural compound. | Ceylon cinnamon is valued for its low coumarin content (<0.004%), unlike Cassia cinnamon, which contains higher levels and can pose health risks. |

Introduction

The dataset contains 60 balanced records of chemical compositions related to Ceylon Cinnamon; all the records are classified into three quality levels which are High, Medium, and Low (20 samples per class).

**High**: Optimal chemical balance, high volatile oil, very low coumarin.

**Medium**: Acceptable quality but slightly lower aroma or marginally higher impurities.

**Low**: Poor composition, possible contamination, or sub-standard levels of key compounds.

Following are the features considered classifying the records into 3 different quality levels.

***Problem Statement***

To automatically classify Ceylon cinnamon samples into three quality categories (High, Medium, or Low) based on their chemical composition, by analyzing six key parameters: Moisture, Ash, Volatile Oil, Acid Insoluble Ash, Chromium, and Coumarin.

The objective is to develop a predictive machine learning model that can:

* Learn complex, nonlinear relationships between the chemical properties and quality grades.
* Provide fast, consistent, and scalable predictions to support quality assurance, pricing, and compliance processes in the cinnamon industry.

***Business Need***

Current manual quality testing is slow, subjective, and inconsistent. By applying ANN:

* Quality grading becomes automated and standardized, which helps in improving the Brand Trust.
* Businesses gain data-driven insights for better pricing, quality control, and regulatory compliance.
* Decision-making is faster, enabling efficient processing and shipment planning.
* Risk Reduction & Compliance
* Product Development & Innovation