



UTM
UNIVERSITI TEKNOLOGI MALAYSIA

SCHOOL OF COMPUTING
Faculty of Engineering

Project Proposal Form MCST1043
Sem: 2 Session: 2024/25

SECTION A: Project Information.

Program Name: **Masters of Science (Data Science)**

Subject Name: **Project 1 (MCST1043)**

Student Name: Zhao Zhihan

Metric Number: MCS241041

Student Email & Phone: zzh85642256@gmail.com

Project Title: Quantitative prediction of mineral resources through data science

Supervisor 1: _____

Supervisor 2 / Industry
Advisor(if any): _____

SECTION B: Project Proposal

Introduction:

With the decrease in the number of outcrop and easily discoverable mines, the current and future focus of mineral exploration will shift to covered areas and deep mining. The research difficulty lies in the collection and analysis of deep mineralization information. The conventional methods and techniques for mineralization information are difficult to identify. Geological exploration data mainly include geological, geophysical, geochemical, remote sensing, and drilling data. Its acquisition methods are diverse (including aerial remote sensing, ground observation, and underground detection), and the data volume is huge. It also has the characteristics of multi-source, heterogeneous, high-dimensional, high computational complexity, and high uncertainty, which conforms to the "4V (volume, velocity, variety, veracity)" features of big data. How to extract the big data features of geological exploration and integrate and fuse the information based on data science is the key to improving the effectiveness of exploration in covered areas and deep mining.

Problem Background:

Modern industry is highly dependent on minerals, long-term mining results in the reduction of surface and shallow minerals, and it is urgent to find deep and hidden minerals. The traditional mineral prediction is based on experience

and simple analysis, it is difficult to accurately deal with massive data, and the prediction accuracy is insufficient. In the era of big data, data science and technology can integrate and analyze multi-source data and mining rules. Using it for mineral prediction can break through traditional limitations, improve efficiency and accuracy, ensure resource security, and promote sustainable development of mining industry.

Problem Statement:

Mineral prediction faces difficulties in multi-source data integration, effective feature extraction, model construction and optimization, and uncertainty assessment. The main research issues include:

1The structure of multi-source data format is complex, so how to integrate and construct mineral prediction data set effectively?

2How to screen and extract the effective features related to mineralization when the original data is large and noisy?

3 There are many data science algorithms, how to choose the algorithm to build mineral prediction model and optimize the performance?

4How to evaluate the uncertainty of prediction results scientifically because of complex geological processes and incomplete data?

Aim of the Project:

Using data science methods to break through the limitations of traditional mineral prediction, build and optimize the prediction model, and scientifically evaluate the uncertainty of the result, so as to improve the accuracy and efficiency of mineral prediction.

Objectives of the Project:

The research objectives are:

1Effectively process and integrate mineral prediction data sets.

2Eliminate noise interference to the data

3Select accurate data science algorithms for universities

4Evaluate data integrity using data science methods

Scopes of the Project:

At present, it is used for the prediction of mineral resources, mainly including: geological, geophysical, geochemical, drilling, drilling and other 5 types of data

Expected Contribution of the Project:

This project uses data science to innovate mineral prediction, develops new algorithms and models to achieve technological innovation, accurately predicts cost reduction and efficiency increase, promotes industry development, reduces environmental damage and promotes sustainable utilization of resources.

Project Requirements:

Software: Python ,matlab, TensorFlow, PyTorch, ArcGIS

Hardware: High-performance computers, large-capacity hard disks, high-speed solid-state drives

Technology/Technique/ Methodology/Algorithm: Data mining technology, machine learning algorithms, deep learning methods
GIS spatial analysis technology, data fusion technology

Type of Project (Focusing on Data Science):

- ☒ Data Preparation and Modeling
- ☒ Data Analysis and Visualization
- ☐ Business Intelligence and Analytics
- ☒ Machine Learning and Prediction
- ☐ Data Science Application in Business Domain

Status of Project:

- ☒ New
- ☐ Continued

If continued, what is the previous title?

SECTION C: Declaration

I declare that this project is proposed by:

- ☒ Myself
- ☐ Supervisor/Industry Advisor ()

Student Name: Zhao zhihan

Signature

Date

SECTION D: Supervisor Acknowledgement

The Supervisor(s) shall complete this section.

I/We agree to become the supervisor(s) for this student under aforesaid proposed title.

Name of Supervisor 1:

Signature

Date _____

Name of Supervisor 2 (if any):

Signature

Date _____

SECTION E: Evaluation Panel Approval

The Evaluator(s) shall complete this section.

Result:

☐ FULL APPROVAL

[] CONDITIONAL APPROVAL (Major)*

[] **CONDITIONAL APPROVAL (Minor)**

[] FAIL*

* Student has to submit new proposal form considering the evaluators' comments.

Comments:

