Project Proposal for Workshop:
"An Introduction to Machine Learning Methods for Geo-Science"

Amir Baqerzadeh
E-mail: amirbaqerzadeh@gmail.com

Title:

Short-Term Temperature Forecasting Using Random Forest Method

1. Introduction

Temperature prediction is very useful in weather science. In this project, I want to predict the temperature 10 minutes later using machine learning. I will use a method called **Random Forest**, which is simple but gives good results. The model will learn from past temperature and weather data from one weather station.

2. Dataset Information

- **Source**: A weather station in Tehran province
- **Time interval**: Every 10 minutes
- **Time period**: About 2 months
- **Total rows**: Around 12,000
- **Features (columns)**:
    - Temperature (target)
    - Wind speed
    - Wind direction
    - Pressure
    - And other near-surface weather variables

3. Project Goal

The goal is to predict the **temperature 10 minutes ahead** using past values of temperature and other variables. I will build a machine learning model using Random Forest regression for this task.

4. Method

- Load and clean the dataset using **Python**
- Create new features using past time steps (for example, temperature 10, 20, and 30 minutes ago)
- Use only past data to predict the next temperature value
- Split the data for training and testing using **time-based method** (not random)
- Train a **Random Forest Regressor** using scikit-learn
- Evaluate the model using **RMSE**, **MAE**, and **R^2**
- Plot real vs predicted temperature for better understanding

5. Tools and Libraries

- **Language**: Python 3
- **Libraries**:
    - Pandas
    - NumPy
    - scikit-learn
    - Matplotlib or Seaborn for plots

6. Expected Results

- A trained model that can predict the next 10-minute temperature
- A simple Python script showing the full process
- Some plots showing the difference between real and predicted temperatures
- A report of model error using standard metrics