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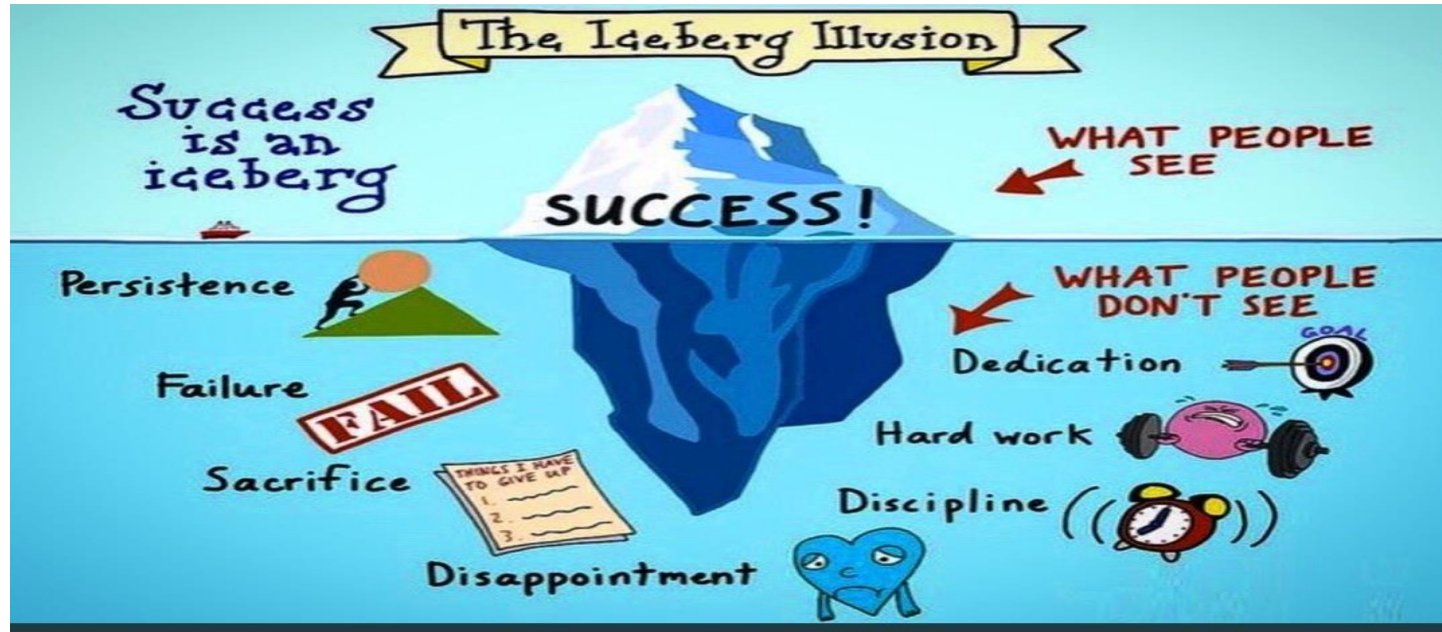
China University of Geosciences

Topic : How to find the road of your research and accomplish it with high academic skills (articles)?

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Supervisor: Professor Li Junxia

Place: Nawangsha Campus

Contents

- Introduction
- How to approach your supervisor
- Selection of your research topic
- The way of reading papers
- Summarizing a research paper
- Application of Machine learning
- Main parts of a research paper
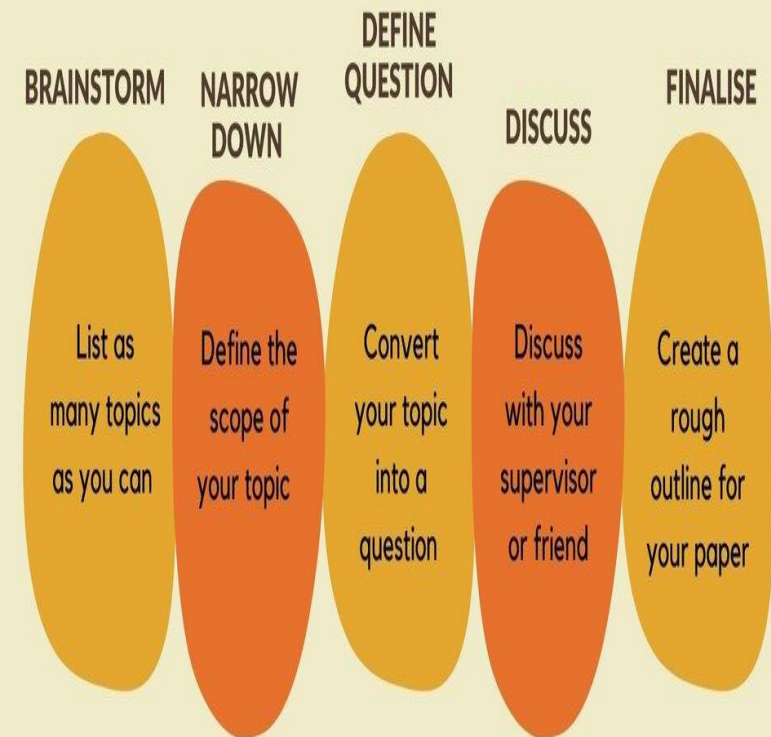- Respond reviewers comments
- Conclusion

How to approach your supervisor

❖ Be on time, can show that your are respecting your supervisor time which can improve his/her perception of you

❖ Be polite and listen carefully to her and do not show that you know to much just respond what he ask if you know if you don't know don't be afraid.

❖ Communicate clearly and have a research plan. This means we have to prepare a proposal for topic you want to work on it.

❖ Reviews together the aims of your research and think how to proceed with the first stages.

Selection of your research topic

❖ Selecting the topic according to your supervisor background or accept her/his project he give to you: It is very important to impress your project supervisor by choosing a practicable project topic that would enable him approve it on time. The choice of a realistic project topic will enhance the interest of the supervisor in your work, this brings about easy and speedy approval of your project topic.

❖ **Brainstorm for ideas**: Choose a topic that interesting you and will enable you to read and understand the articles and books you find. Ensure that the topic is manageable and that material is available

SELECTING A RESEARCH PAPER TOPIC

BRAINSTORM — List as many topics as you can

NARROW DOWN — Define the scope of your topic

DEFINE QUESTION — Convert your topic into a question

DISCUSS — Discuss with your supervisor or friend

FINALISE — Create a rough outline for your paper

Go Assignment Help

Cont.

- ❖ A topic you are curious about: Choose a research topic that you know a little about but still you have a quest to know more about it. If you are choosing a research topic that you already know everything you will bring up everything that you already knew onto a piece of paper. This is not the aim of writing a research paper. Your research paper is your journey to know the answers to a question that you are curious about.

- ❖ Availability of sources : Enough sources available so that you can quote in your research paper. Selecting a topic on which there is not any source material available can make your writing very difficult. Ample reference material is necessary as you will be at ease to finish the research on time

① SKIM

First get the "big picture" by reading the title, key words and abstract carefully; this will tell you the major findings and why they matter.

- Quickly scan the article without taking notes; focus on headings and subheadings.
- Note the publishing date; for many areas, current research is more relevant.
- Note any terms and parts you don't understand for further reading.

Reading is a conversation. All books talk. But a good book listens as well.
—— *Mark Haddon*

GH
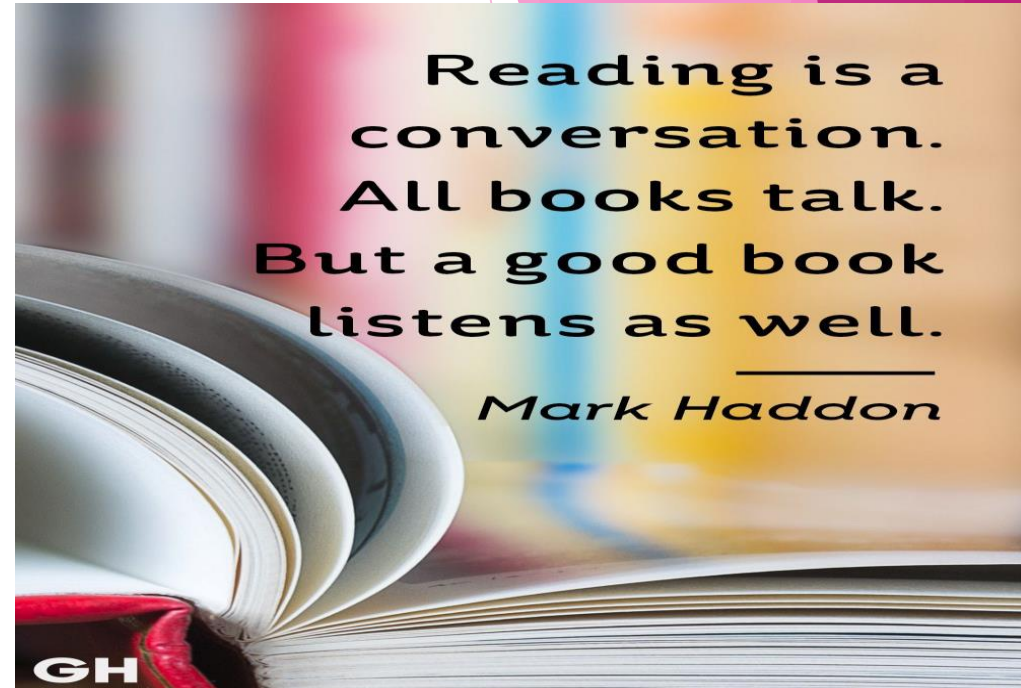
❖ Skim all of the sections of the paper

❖ Identify how this paper fits in with the field.

❖ Read the introduction. In the introduction you understand the importance road map for the paper. It conveys a lot of information like the background of the topic , why it is important, and the plan to proceed with the discussion

❖ Look through the results and methods sections. Write a succinct summary of the research, and the keyword related to your fields
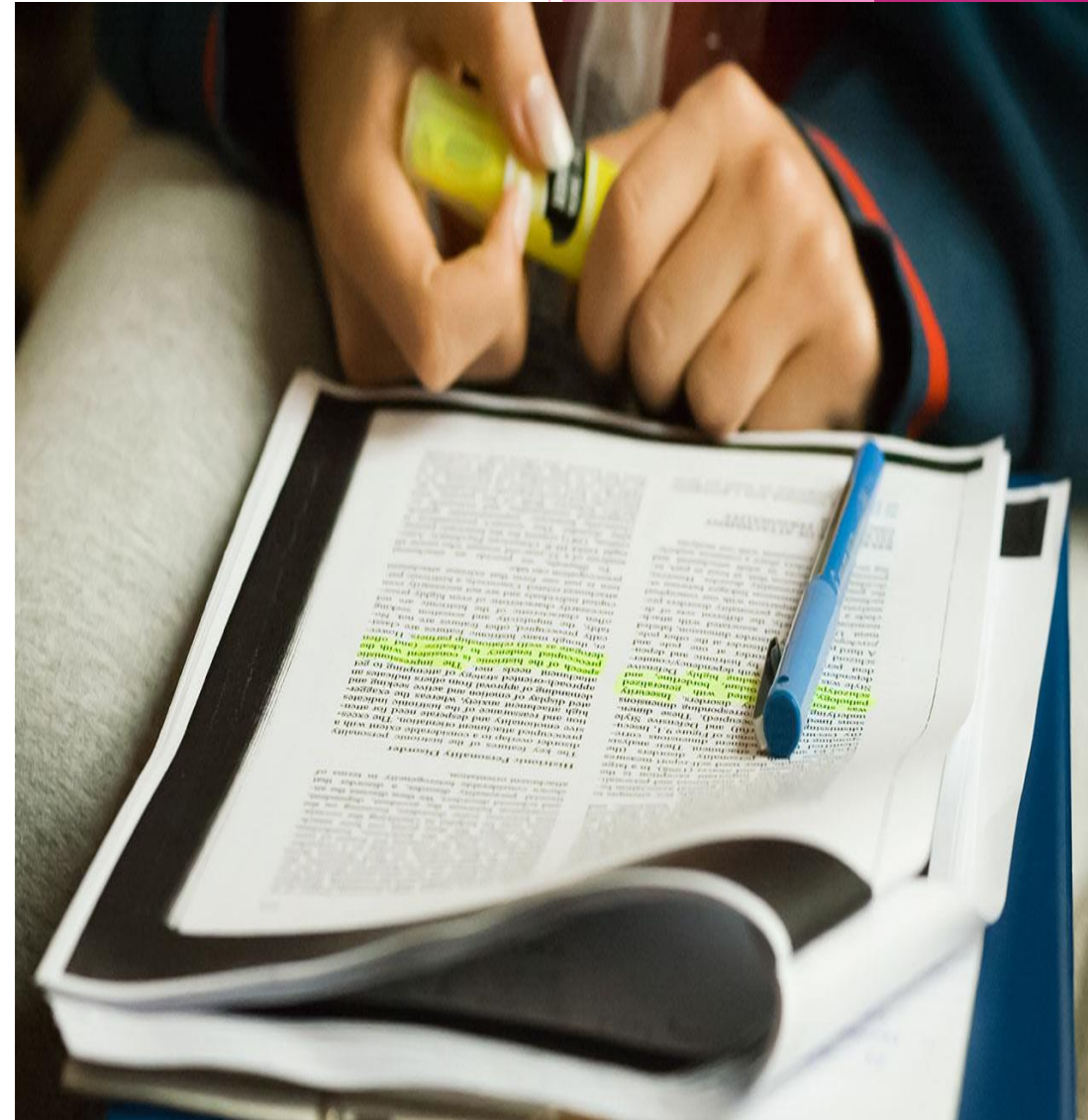
Summarizing a research paper

❖ Write the title of each paper you have read in your note book by numbering each paper.

❖ State the main ideas: the main idea, is the most important concept that the author wants to get across. Summarizing paragraphs and looking at how details are connected can help to determine the main idea or central point of an article.

❖ Identify the methods used and how the methods are developed

❖ Summarize the main findings which means what results the author get in his research

❖ Summarize in your own words

Why machine learning?

Application of Machine Learning

❖ Artificial intelligence systems are used to perform complex tasks in a way that is similar to how humans solve problems.

❖ Deep learning is employed for face recognition, virtual assistants, driverless cars, and other practice.

Human

I can learn everything automatically from experiences. Can u learn?

Yes, I can also learn from past data with the help of Machine learning

Machine

Artificial Intelligence → Ability of a machine to imitate intelligent human behavior

Machine Learning → Application of AI that allows a system to automatically learn and improve from experience

Deep Learning → Application of Machine Learning that uses complex algorithms and deep neural nets to train a model

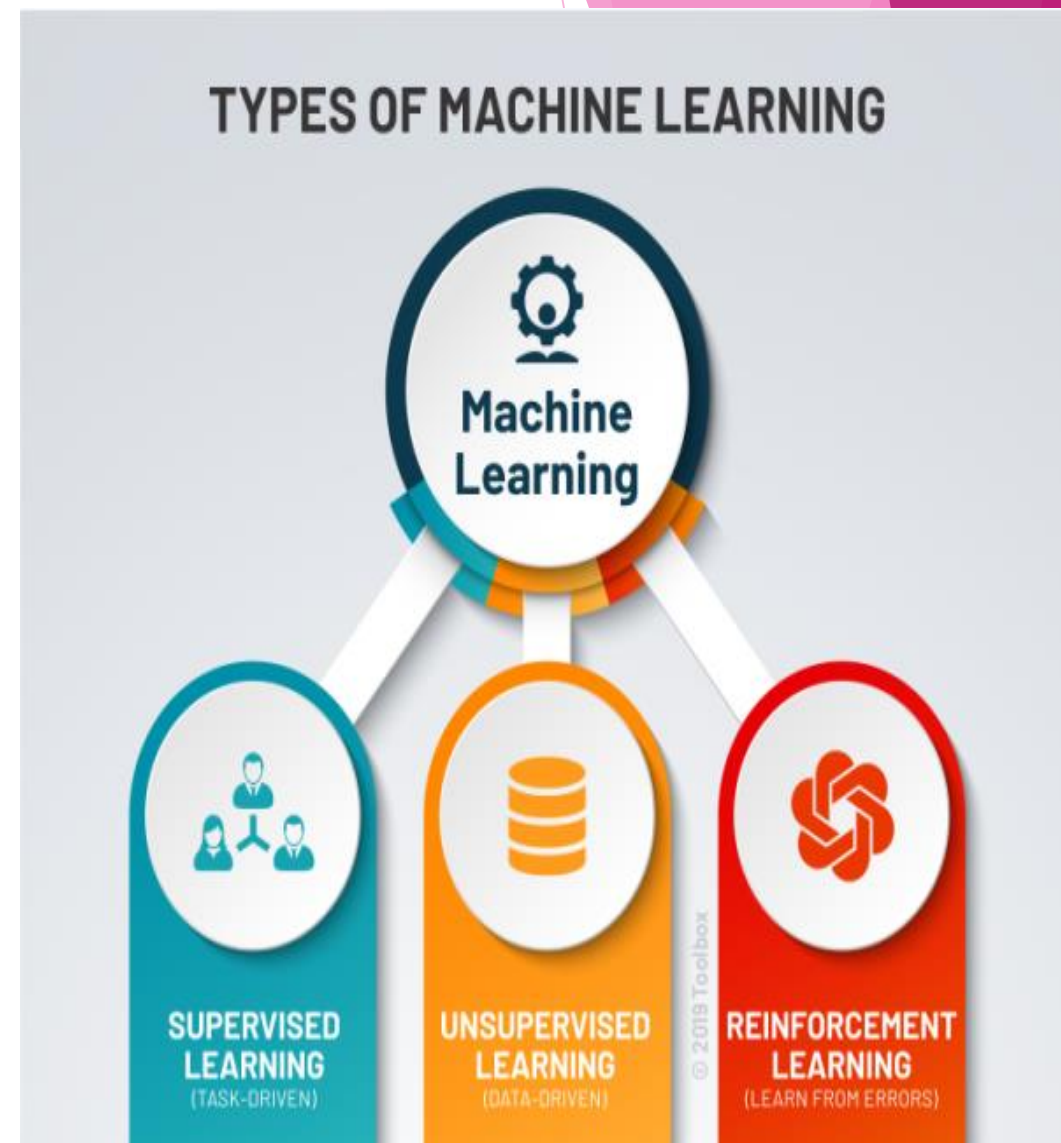# How I get ideas for the machine learning

- ▶ Starting reading reviews papers

- ▶ Reading previous and current works

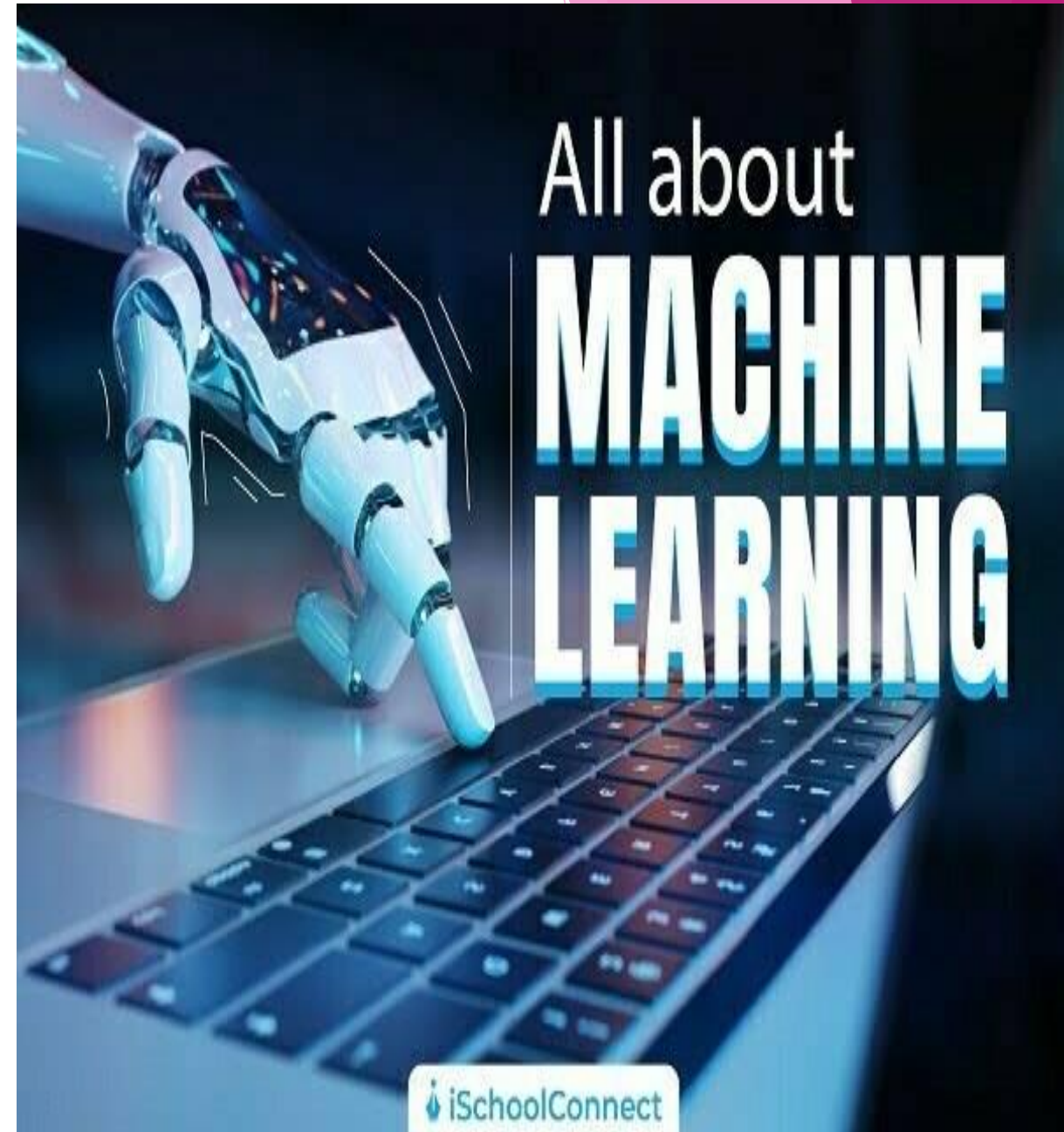- ▶ Findings papers that are clear to understand

FINDING RESEARCH IDEAS

Types of machine learning

❖ Machine learning constitutes a sector of AI and focuses on using data and algorithms applied to determine or predict something in a real-world dataset. Machine learning is comprised of supervised, unsupervised, and reinforcement learning.

❖ Unsupervised machine learning utilizes machine learning algorithms to analyze and group data that are not labeled, and these algorithms do not require human interventions. Is a kind of self-learning where the algorithm can find previously hidden patterns in the unlabeled datasets and give the required output without any interference.

TYPES OF MACHINE LEARNING

Machine Learning

SUPERVISED LEARNING (TASK-DRIVEN)

UNSUPERVISED LEARNING (DATA-DRIVEN)

REINFORCEMENT LEARNING (LEARN FROM ERRORS)

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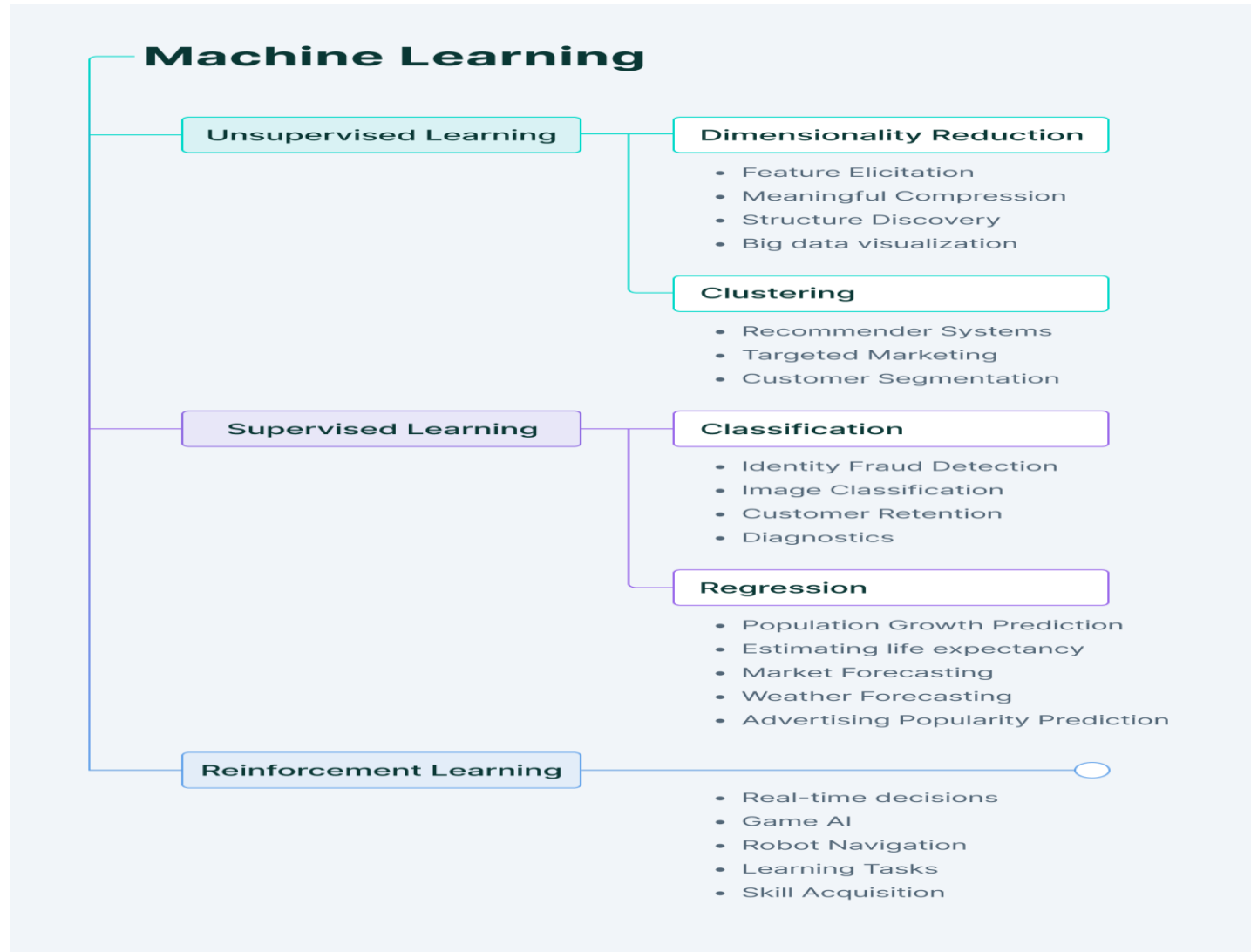# Cont.

❖ However, the supervised is a category of machine learning that uses labeled data to train the algorithm and make a prediction.

❖ They can be utilized in several fields, such as the medical field, management, hydrology, and other fields

Machine Learning

Unsupervised Learning

Dimensionality Reduction
- Feature Elicitation
- Meaningful Compression
- Structure Discovery
- Big data visualization

Clustering
- Recommender Systems
- Targeted Marketing
- Customer Segmentation

Supervised Learning

Classification
- Identity Fraud Detection
- Image Classification
- Customer Retention
- Diagnostics

Regression
- Population Growth Prediction
- Estimating life expectancy
- Market Forecasting
- Weather Forecasting
- Advertising Popularity Prediction

Reinforcement Learning
- Real-time decisions
- Game AI
- Robot Navigation
- Learning Tasks
- Skill Acquisition

Starting points of machine learning

❖ **Collecting Data:** Machine learning initially learn from the data that you give them. It is important to collect or to have reliable data so that your machine learning model can find the correct patterns.

❖ **Define the problem:** you need to understand your dataset and identify the type of problems your going to solve. In machine there is regression and classification analysis.

❖ **The regression analysis** is when the outcome is a numerical and continuous value, but the classification is when the outcome is a category. In the classification analysis, there is binary classification when the answer is two classes (yes or no or 0 or 1) and multiclassification when the outcome has more classes

❖ **Choose the software and be familiar with it:** they are several software to run machine learning algorithms such as R programming, Python language, MATLAB, JavaScript C++ and other etc......

Example

▶ The data was converted into high and low classes by allocating zero (0) to all fluoride concentrations lower than 1 mg/L and assigning by one (1) for the fluoride concentrations higher than 1 mg/L.

▶ The three models were carried out using the Python3.7 programming language.

Cont.

❖ Selecting the methods: In this part I suggest to select the basics methods first that will allow to master the software and understating the dataset

❖ Find the suitable code of the methods you want to develop

❖ Install the necessary and basics library your are going to use in your model this will avoid to have unnecessary errors.

✓ https://github.com/

✓ https://github.com/Nafouant/Nafouanti-Mouigni-Baraka

✓ https://lib-zodpagjck76agkujw4qvlfug.1lib.me/

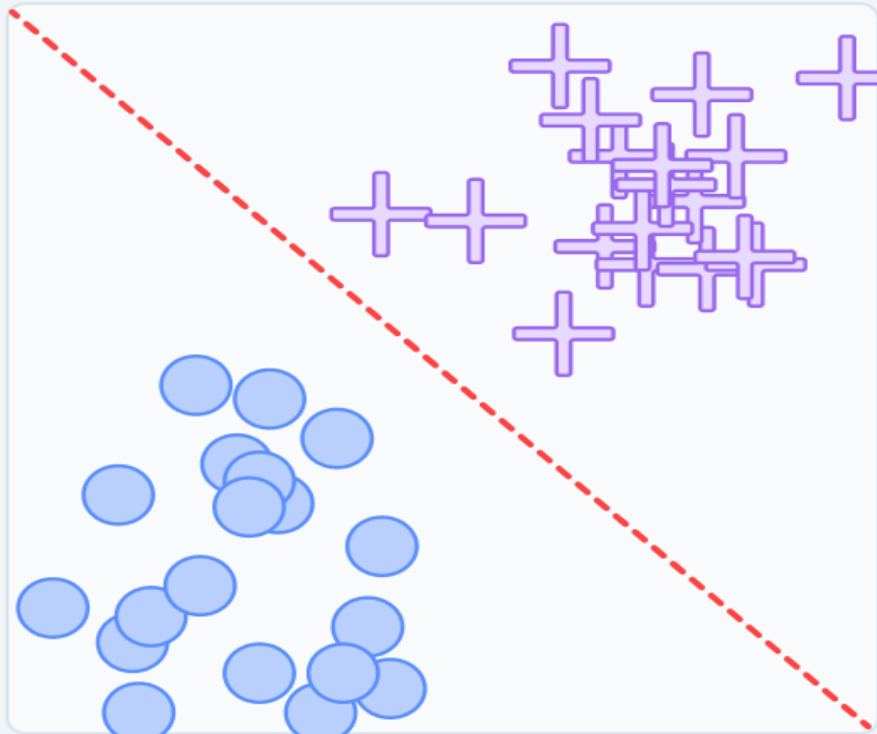✓ I will suggested you the book of this author(Jason Bronlee)

Example

▶ Random Forest (RF), Artificial Neural Network (ANN), and Logistic Regression (LR) were used in this study for groundwater fluoride prediction in Datong Basin
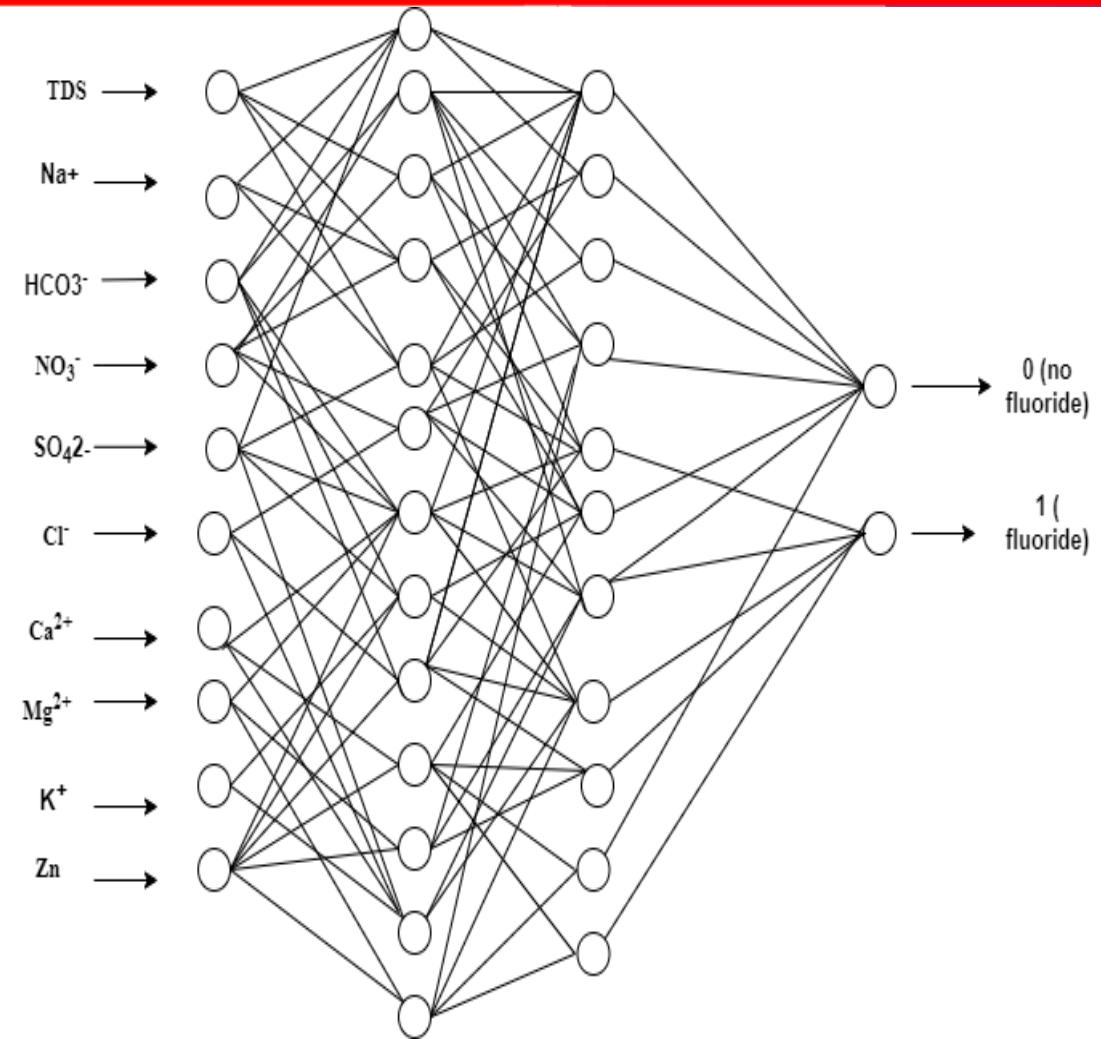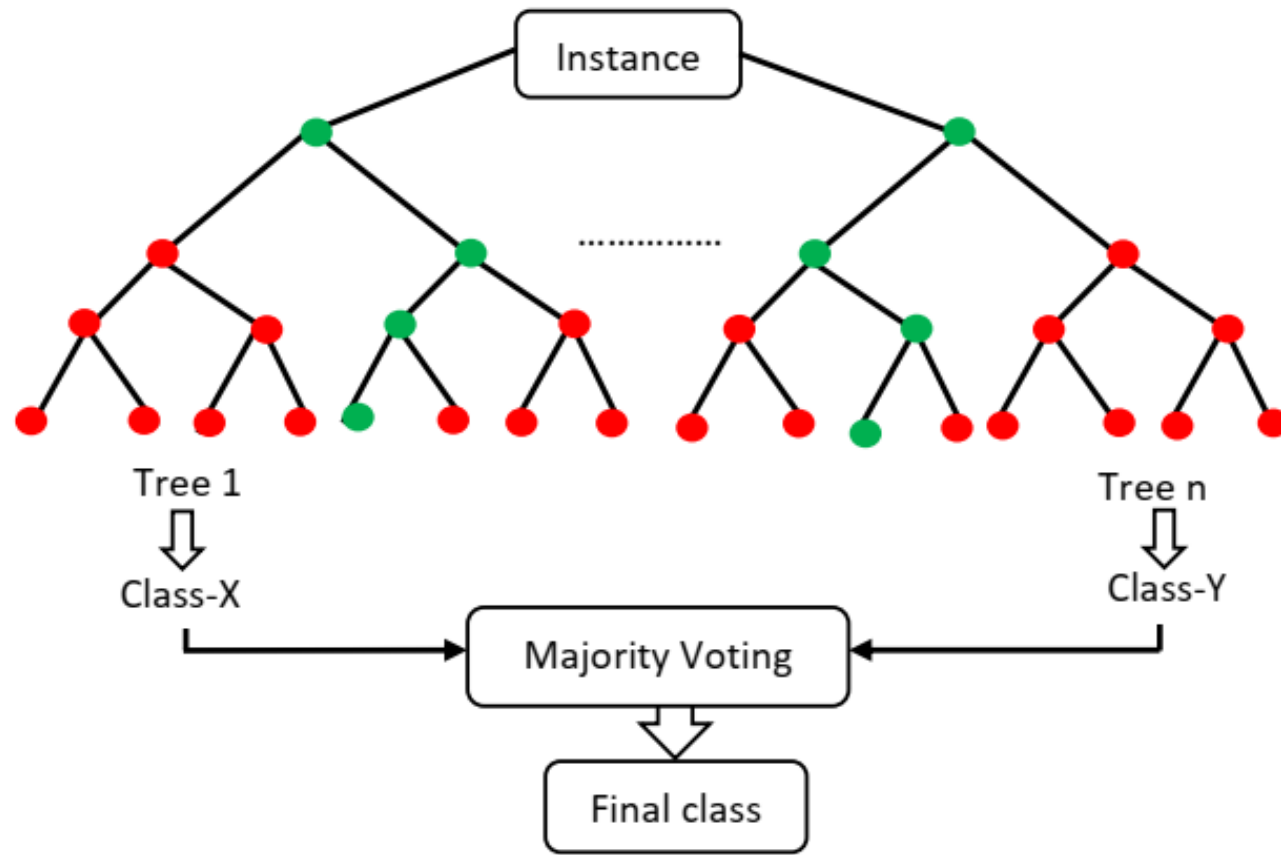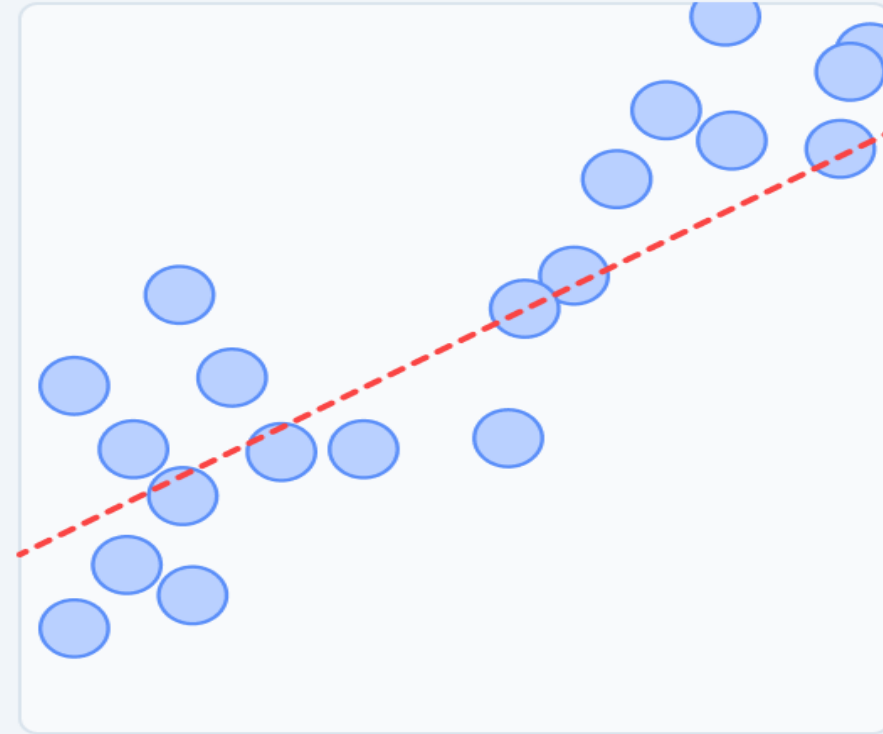
Example graph for regression and Classification

Build the model

❖ **Preparing the dataset:** This is called the preprocessing is the first step before build the machine learning model.

❖ **When using data sets to train machine learning models, you'll often hear the phrase "garbage in, garbage out" This means that if you use bad or "dirty" data to train your model, you'll end up with a bad, improperly trained model that won't actually be relevant to your analysis.**

❖ **Data preprocessing is divided into four stages: data cleaning, data integration, data reduction, and data transformation. In this stage we clean the data by dealing with the missing value, reduce noise.**

❖ **Normalize the dataset: The goal of normalization is to change the values of numeric columns in the dataset to use a common scale, without distorting differences in the ranges of values or losing information**

Garbage Data → Powerful Machine Learning Models → Garbage Results
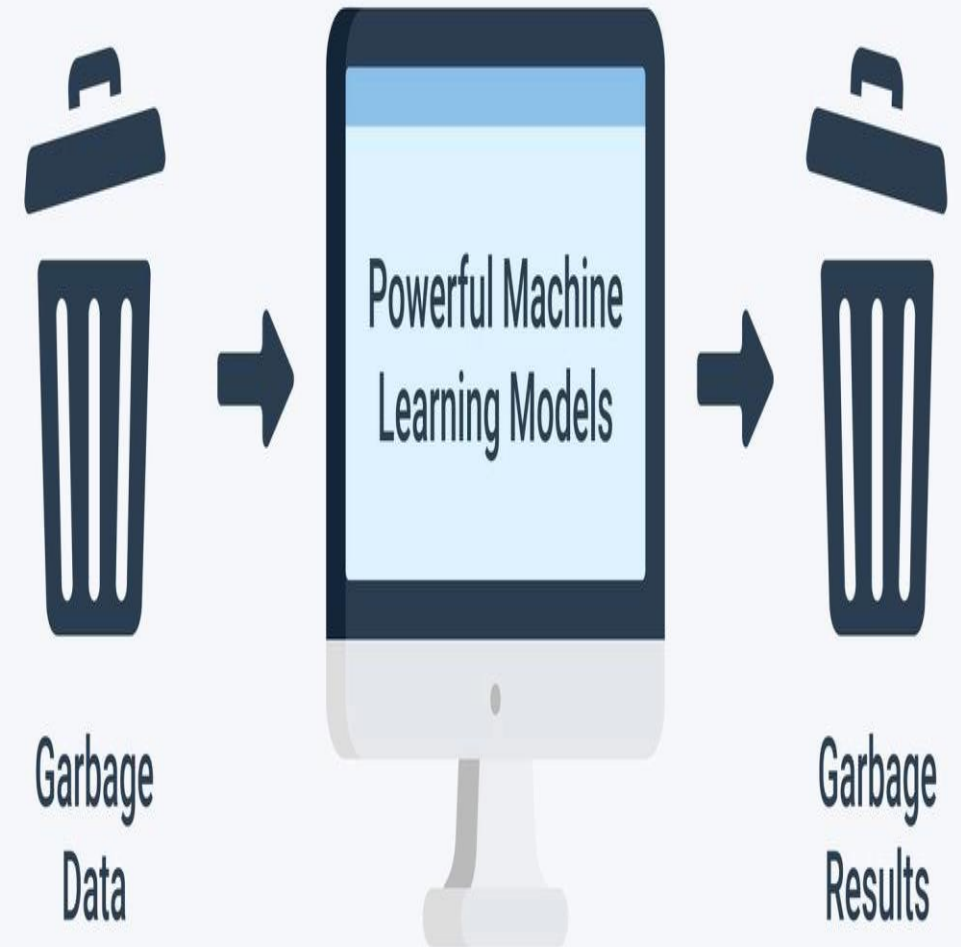
Cont.

- ❖ **Reduce your dataset: Feature Selection is the method of reducing the input variable to your model by using only relevant data and getting rid of noise in data. It is the process of automatically choosing relevant features for your machine learning model based on the type of problem you are trying to solve.**

- ❖ **Define the model and divided the data in to training and testing**

- ❖ **The training data is the biggest (in -size) subset of the original dataset, which is used to train or fit the machine learning model. Firstly, the training data is fed to the ML algorithms, which lets them learn how to make predictions for the given task.**

- ❖ **Test dataset evaluates the performance of the model and ensures that the model can generalize well with the new or unseen dataset. The test dataset is another subset of original data, which is independent of the training dataset**

▶ For selecting the relevant inputs, filter methods were applied in this study. In the filter methods, the Chi-squared was implemented in this study as a feature selection method.

The Formula for Chi Square Is

$$\chi_c^2 = \sum \frac{(O_i - E_i)^2}{E_i}$$

where:

c = degrees of freedom

O = observed value(s)

E = expected value(s)

Metric evaluation for ML

❖ Evaluation metrics are used to measure the quality of the machine learning model. Which is essential for any project. There are many different types of evaluation metrics available to test a model according the analysis we are dealing with.

✓ For regression analysis: Mean Absolute Error (MAE) MAE is a fundamental and most used evaluation metric for regression problems. ...

✓ Mean Absolute Percentage Error (MAPE) ...

✓ Mean Squared Error (MSE) ...

✓ Root Mean Squared Error (RMSE) ...

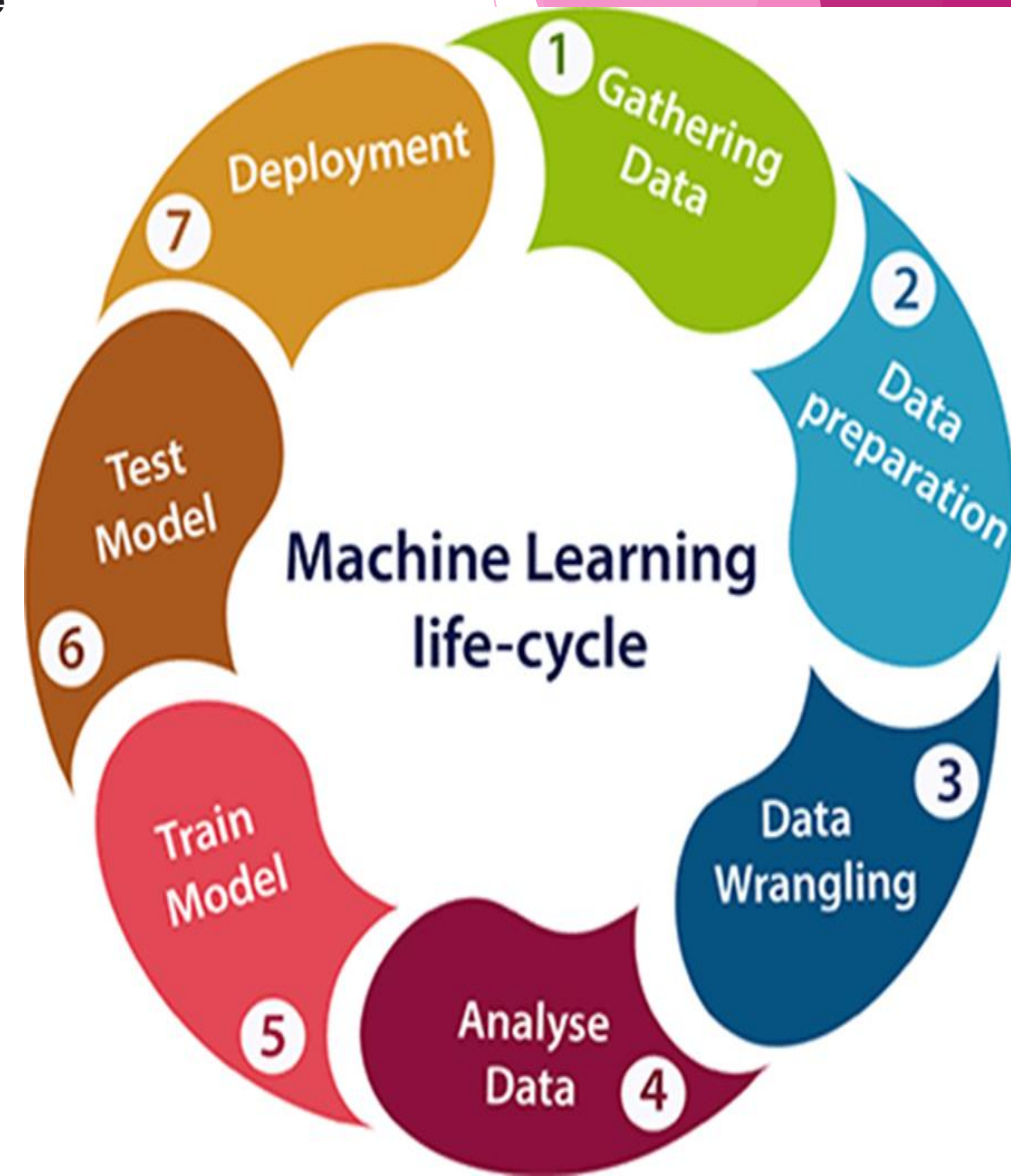✓ R-Squared (R²)

❖ For classification: Precision (Positive Predicted Value)

✓ Recall (Sensitivity, True Positive Rate)

✓ Specificity (Selectivity, True Negative Rate)

✓ Fall-out (False Positive Rate)

✓ Miss Rate (False Negative Rate)

✓ Receiver-Operator Curve (ROC Curve) and Area Under the Curve (AUC)

Dreaming to write a paper

I dream to write a research paper
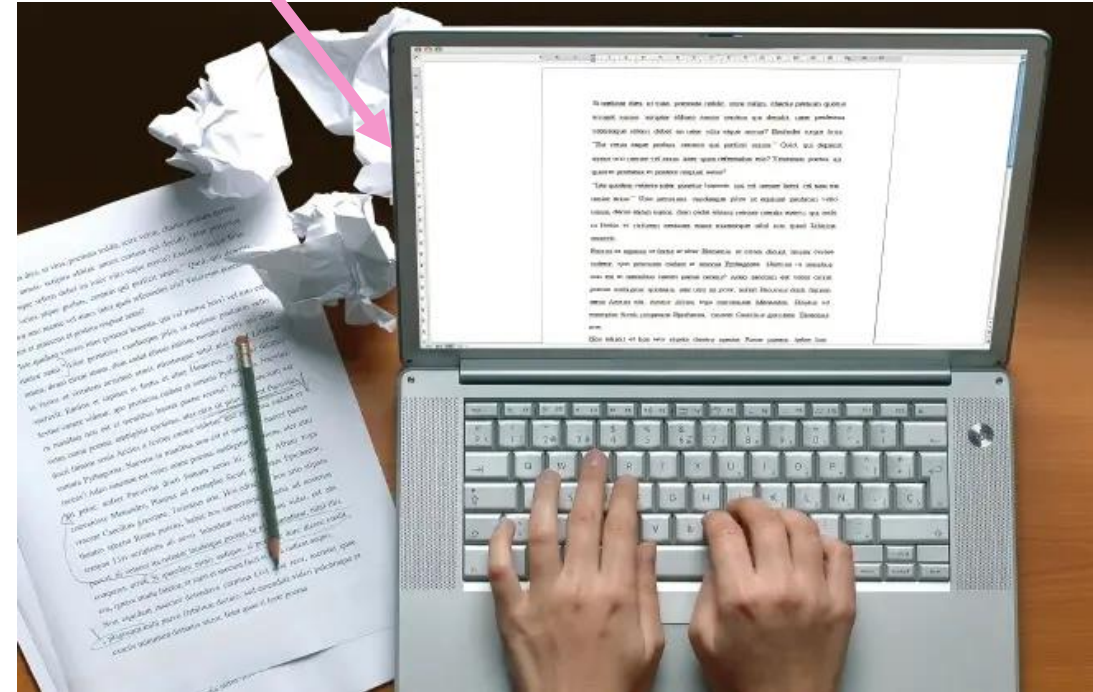
HOW TO WRITE A RESEARCH PAPER

What is a Research Paper?

A research paper is a piece of academic writing, consisting of analysis, interpretation. and argument-based research. In comparison essays, research papers are far more detailed. They don't only focus on your writing skills, but your research skills as well, hence the name 'research paper'. When writing a research paper, you don't just share your opinion on the matter, but also include a lot of factual information including any relevant sources.

4 STEPS FOR WRITING A REASEARCH PAPER

Main part of a research paper

A research is composed of :

- Abstract or Summary.
- Introduction.
- Methods.
- Results and discussions
- Conclusions
- References

- Abstract: is composed of the importance of the research (reason of writing), problem your going to solve, methodology used,results,and implication of the study.

- Introduction: introduce the topic (tell the interest of your topic),describe the background, establish your research problem, specify your objective, and map out your paper

- Methodology: should begin by describing your research question and the type of data you used in answering it. Explain the approach you chose, describe how you collected the data, the methods you used to analyze the data.

- Results: The results section of the research paper is where you report the findings of your study based upon the information gathered as a result of the methodology you applied. The results section should simply state the findings, without bias or interpretation, and arranged in a logical sequence.

Cont.

❖ **Discussion: Summarize your key findings by only discuss the data you already reported .**

Example The study demonstrates a correlation between…

✓ **interpretation of your results for example the results might suggest that *however*, based on the findings of similar studies, a more plausible explanation is *y*.**

✓ **Discuss the implications which show how your findings fit with existing knowledge, what new insights they contribute, and what consequences they have for theory or practice.**

Example These results build on existing evidence of…..

✓ **Acknowledge the limitations even the best research has its limitations. Acknowledging these is important to demonstrate your credibility. Limitations aren't about listing your errors, but about providing an accurate picture of what can and cannot be concluded from your study.**

❖ **Example, Due to the lack of data on *x*, the results cannot confirm……**

❖ **Conclusion: Restate your research topic**

✓ **Example: The increase in water pollution since 2010 has contributed to the decrease in aquatic wildlife as well as the increase in unsafe drinking water**

✓ **Summarize the main points**

✓ **Example: The study proposed the advantage of integrating ML, geochemical, and MVA techniques that lead to improved prediction of TOC and source rock evaluation**

✓ **State the significance or results, or findings: Our findings revealed that the proposed hybrid HRFLM outperformed the Boost, Light, and RF in forecasting fluoride pollution in groundwater**

✓ **Conclude your thoughts: Generally, the consensus of geochemical, statistical, and machine learning methods suggests that the combination of this interactive method provides good results and can be applied in source rock evaluation worldwide.**

How to respond reviewers comments

- ❖ **Provide an overview, then quote the full set of reviews**

- ❖ **Be polite and respectful of all reviewers : Even if you are convinced that the reviewer lacks intellectual capacity, it is certainly not in your interest to convey this impression to the reviewer. Keep in mind that if the reviewer failed to understand something, the fault likely lies, at least in part, with you for not making the point clear enough**

- ❖ **Accept the blame: If the reviewer failed to understand something, apologize for not making it clear. Even if you are convinced that the text is already clear.**

- ❖ **Make the response self-contained: When you make changes to the text or to figures, quote the changes directly in the response. If possible, you can refer to the specific line number where the changes were applied**

- ❖ **Respond to every point raised by the reviewer. In some cases, the reviewer may disagree with your response, but you should not try to avoid a difficult point by simply ignoring it.**

Journey of a Manuscript through Peer Review

The manuscript states that this apple is filled with more nutrients than any other fruit.

Reviewer 1: You should have used peaches instead.

Reviewer 2: This is not an apple, it is a pear.

Reviewer 3: I want this apple to make calls too!
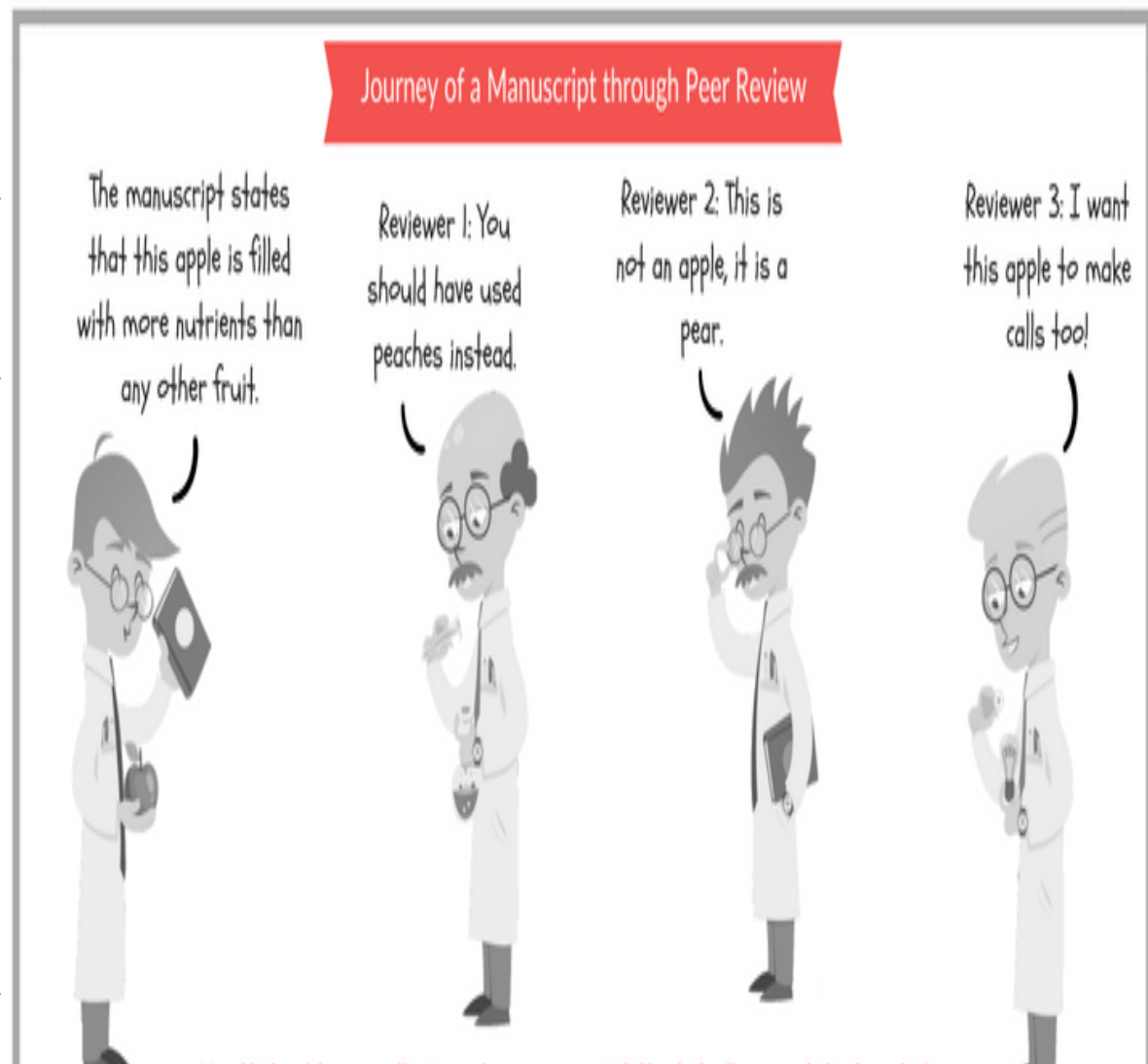
❖ Whenever possible, begin your response to each comment with a direct answer to the point being raised: When the reviewer is correct, state so in your response. Your goal is to show the reviewer that you took their comments seriously, and you should quickly convey what you did in response to their critique

❖ When possible, do what the reviewer asks :In general, you should avoid giving the impression that you couldn't be bothered to carry out the additional experiments or analyses that the reviewer asks for. Even in cases in which you believe the reviewer has requested an analysis that you don't find informative, or is otherwise flawed, you will often be in a stronger position if you do what the reviewer asked, report the results in your response, and then explain why you believe the results do not belong in your manuscript.

❖ Be clear about what changed relative to the previous version

Example

❖ **First sentence to start when answering review comments:**

➢ We would like to thank the anonymous reviewers for their time and energy spent on our paper to raise it to the publication standard required. We are humbly grateful for the opportunity given to us to revise our work and resubmit again for possible consideration for publication. We acknowledge all the constructive comments and have made the necessary corrections based on the reviewers' suggestions and comments in the revised manuscript. The corresponding changes made in the revised manuscript are indicated in the red-colored text in a point-by-point response to the reviewers' comments. We sincerely hope that the Editor and the Reviewers will see our responses to these comments and the revisions made in the manuscript as an improvement

❖ **When you agree with review comment**

A: Describe the system configurations where you have conducted the experiments.

B: Response: Thanks for pointing out this. The system configuration for where we have conducted the experiments has been implemented in the manuscript on the methodology part section 3.1. Furthermore, the flow chart of the modeling procedures has been implemented in 3.2.1 (Lines 190-191) Fig. 3.

Cont.

❖ **when you disagree with review comment**

➢ **Response: Thank you for your insightful comments we highly appreciate such kind of remark. However our model deal with classification analysis the metric you suggests to consider are for regression analysis. Therefore the metric used in our study to evaluate the model are reliable. Previous studies (reference) employed the same metric to evaluate classification analysis. Also, in ML those metric appropriate to assess classification problem (reference).**

Three golden rules for responding to reviewer comments [1]

Respond completely

Respond politely

Respond with evidence

Conclusion

❖ Research is the cornerstone of any academic field and it is how we come to understand what we know, and how we can apply that knowledge to problems in the world. Without research, we would be stuck in a state of ignorance. Choosing a topic is the first and maybe the most important step of the research and writing process and will determine the rest of the research steps. Therefore find the best road of achieving our research is a crucial point in the academic life. Furthermore, find innovative methods such as the artificial intelligence models enhance the innovation of different fields and improve the probability of publication. Although, it is very challenging but hard work and be patient are the main keys that will lead us accomplish a good academic results.

Thank you for listening!