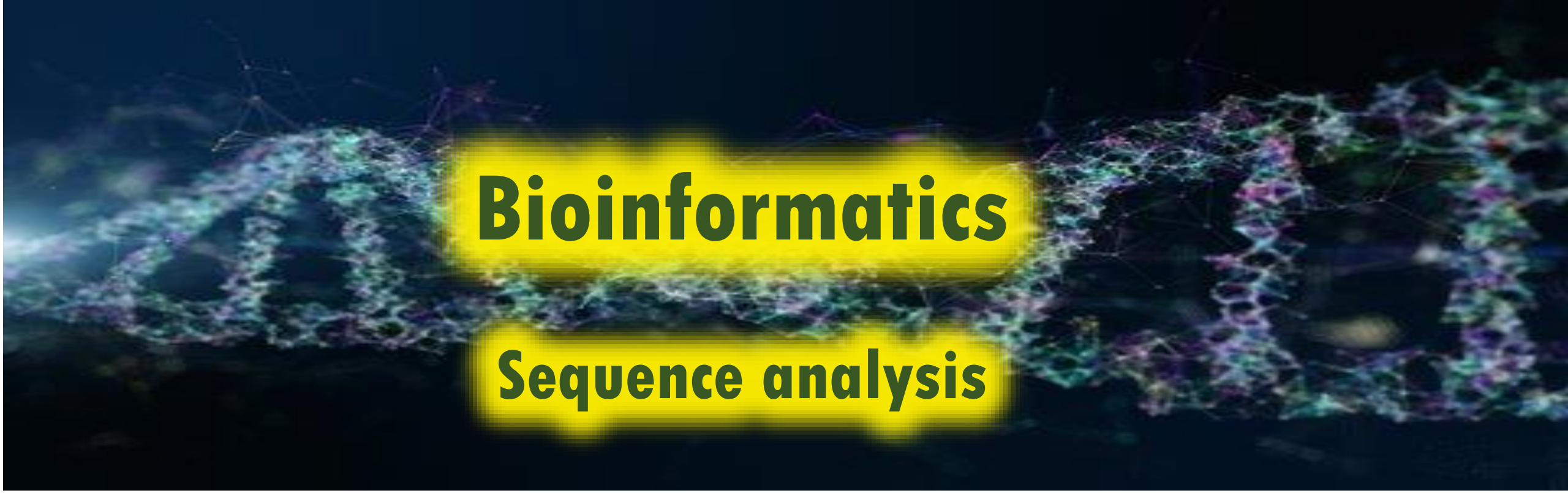
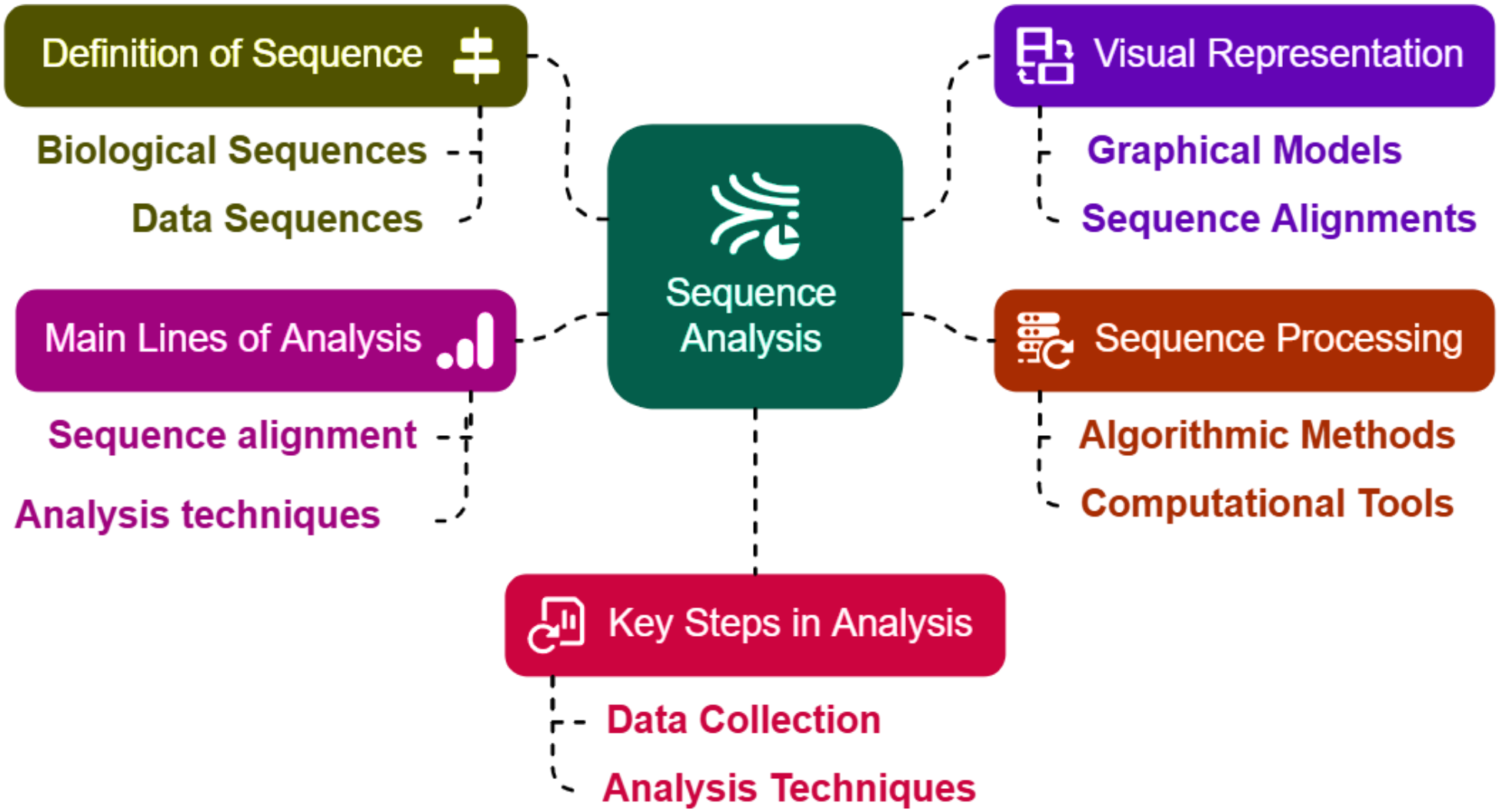


Bioinformatics

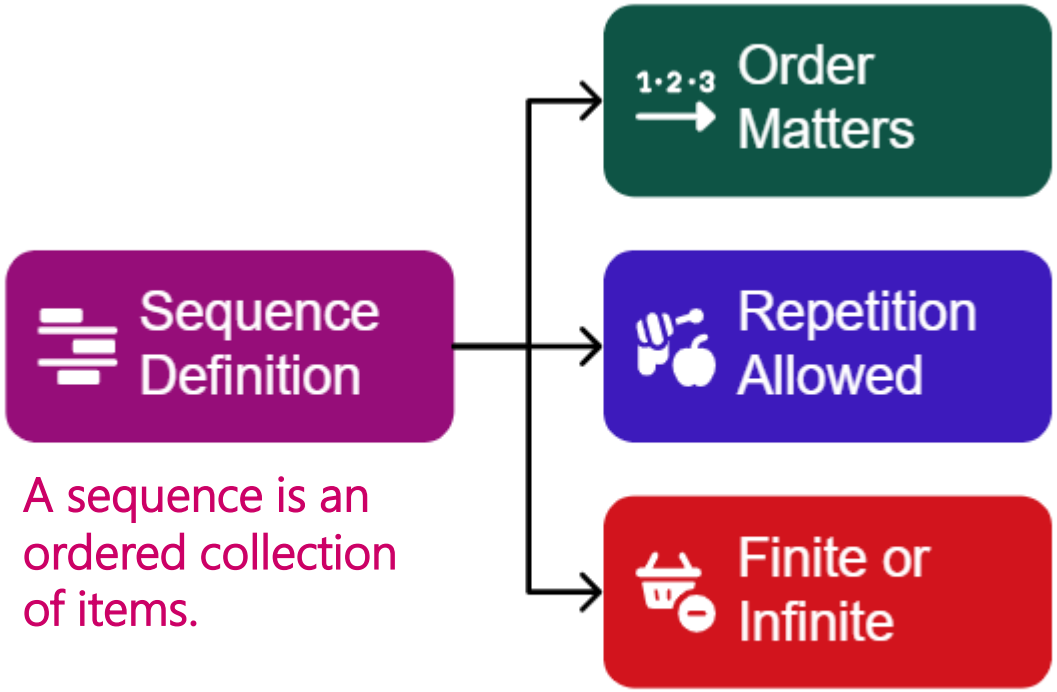
Sequence analysis

Assis. Prof. Dr. Labeed Al – Saad

The objectives



What is a sequence?



A sequence is an ordered collection of items.

The sequence "1, 2, 3" is different from "3, 2, 1".

The sequence "apple, banana, apple" is perfectly valid.

Examples of finite sequences include shopping lists or steps in a recipe.

The sequence of natural numbers (1, 2, 3, ...) is an infinite sequence.

What is a sequence?

The Role of Sequences in Various Fields

Mathematics

Used to study series, calculus, and other areas

Computer Science

Applied in algorithms, data structures, and text processing

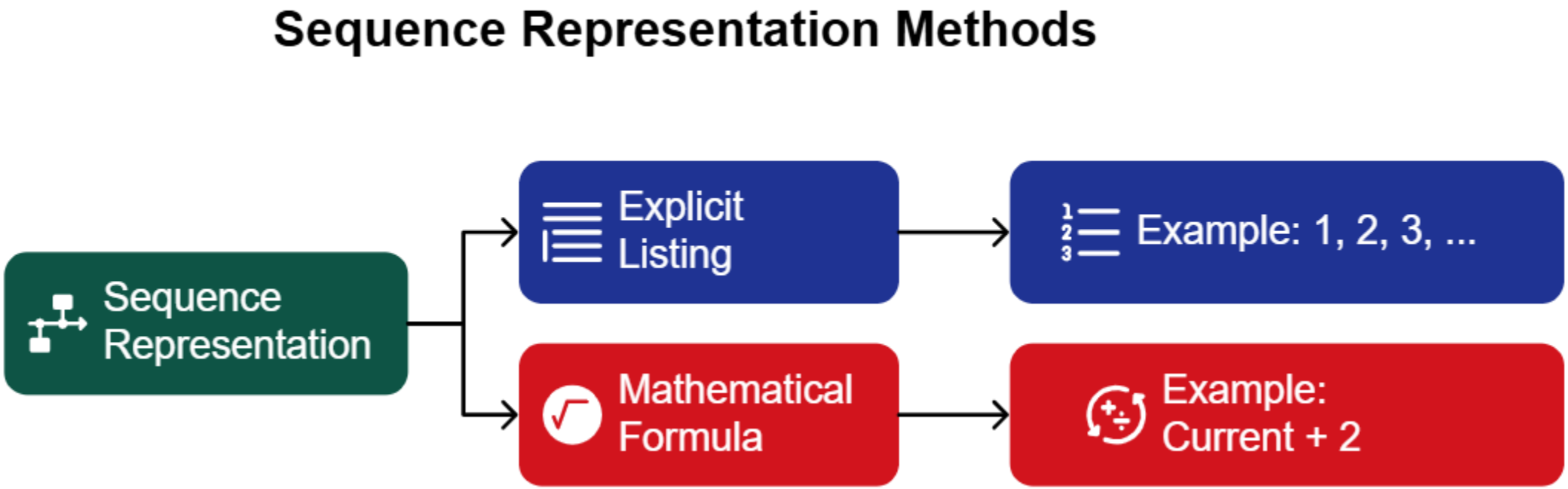
Biology

Essential for understanding DNA, RNA, and protein sequences

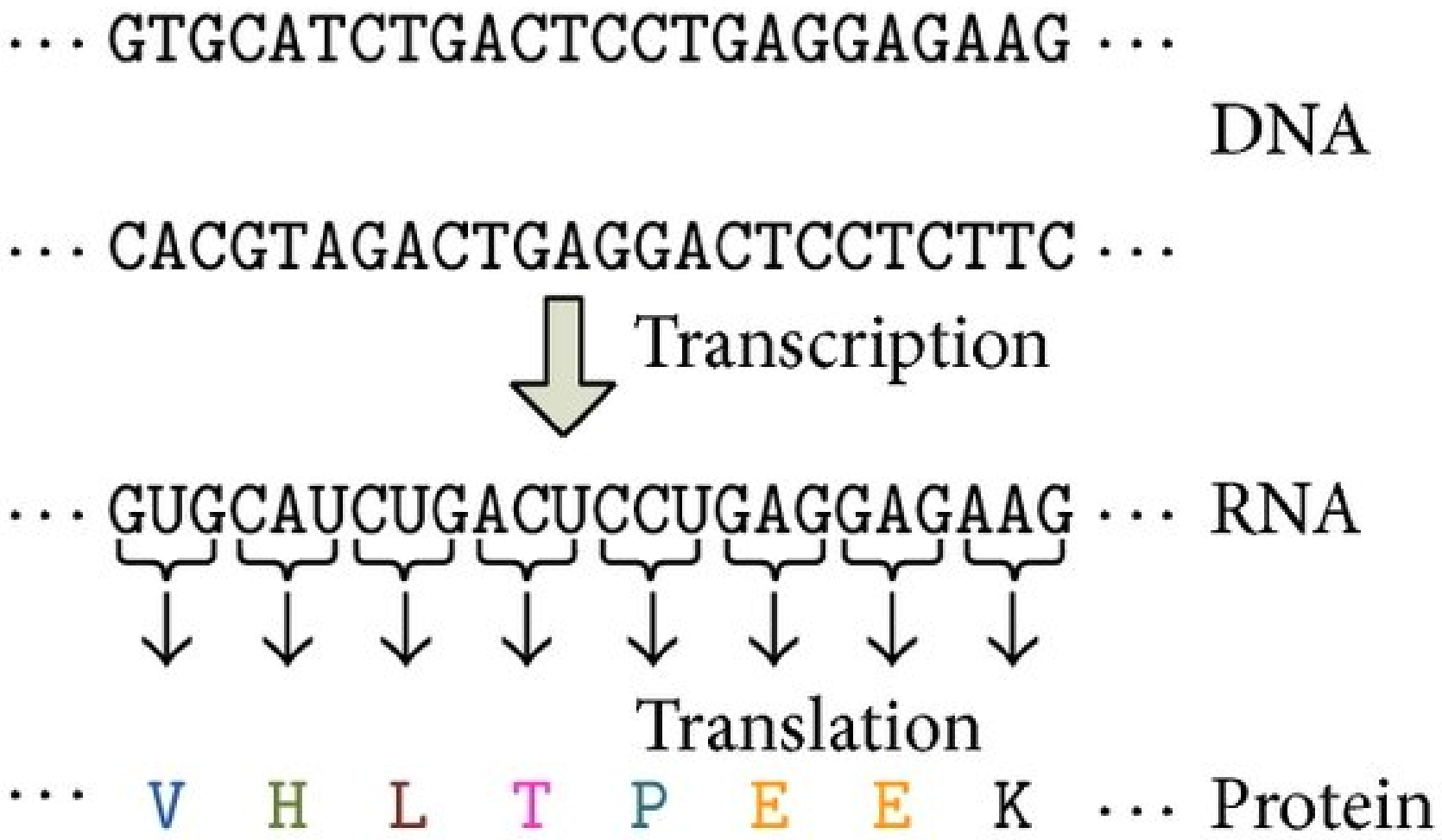
Music

Formed by the order of notes in a composition

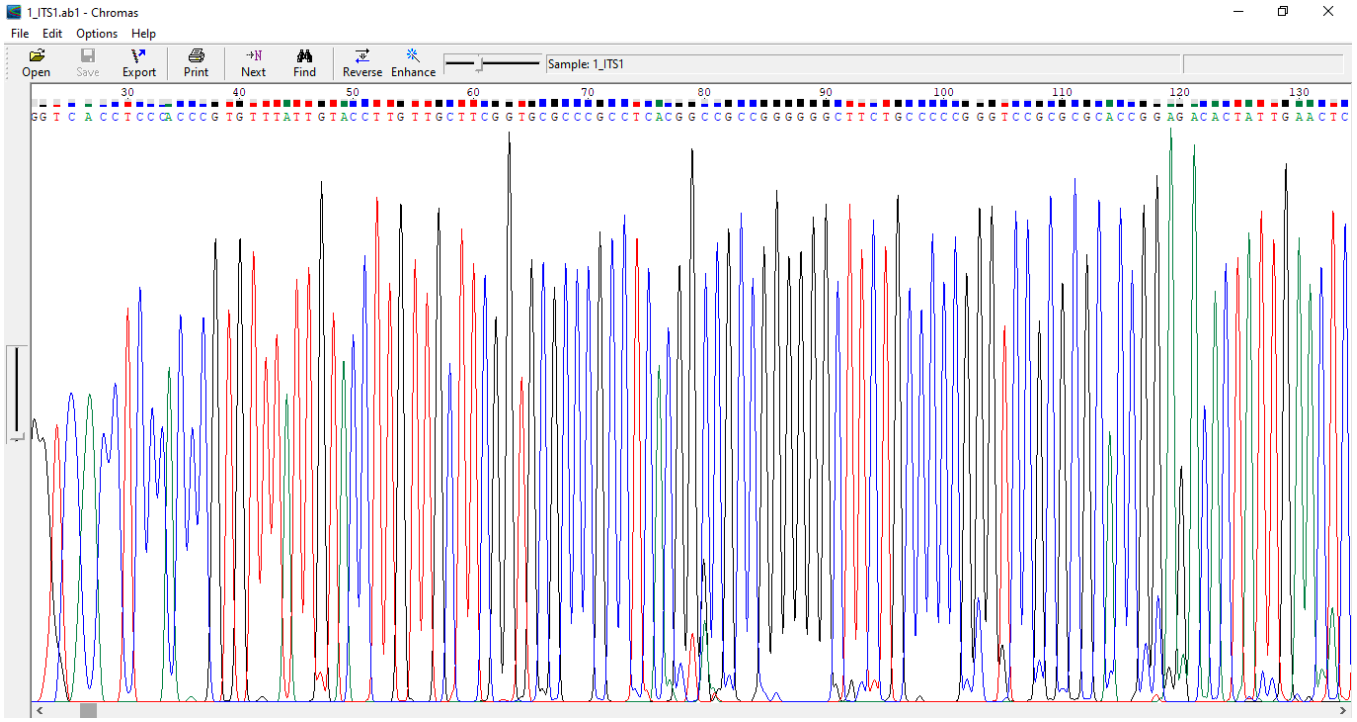
What is a sequence?



How Does Sequence Looks Like?



How Does Sequence Looks Like?



>1_ITS1
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ACACTATTGAACTCTGTCTGAAGATTGCAGTCTGAGCATAAACTAAATAAGTTAAAACTT
TCAACAACGGATCTCTTGGTTCCGGCATCGATGAAGAACGCAGCGAAATGCGATAACTAA
TGTGAATTGCAGAATTCAGTGAATCATCGAGTCTTTGAACGCACATTGCGCCCCCTGGTA
TTCCGGGGGGCATGCCTGTCCGAGCGTCATTGCTGCCCTCAAGCACGGCTTGTGTGTTGG
GCTCCGTCCCCCCGGGGACGGGTCCGAAAGGCAGCGGCGGCACCGAGTCCGGTCCTCGAG
CGTATGGGGCTTTGTCACCCGCTCTGTAGGCCCGGCCGGCGCCAGCCGACAACCAATCAT
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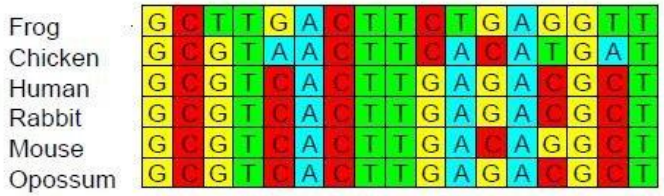
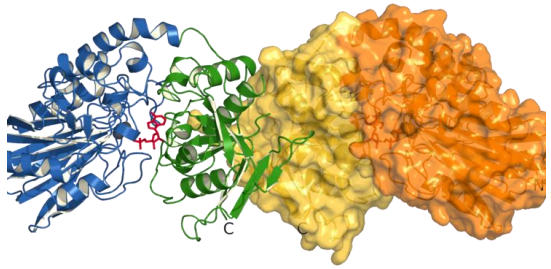
ATATTTACACCCCCGGGGGGGGTGGTTGTCCCCCCCCCCCCAGAGAAATAAGAAGGGCAAC
CGAACAACCTACCTAAGATGGGTGTTTGTTTTTCTTTTCTTTGTCCCCCGGCCCCCCCAT
CCAAAATATTTTTTTTTTTTGTATCTGGTTGGGAGGCGGGGACCCCACATCCGTAAATT
AGTAAAAAAAAAAAAAAAAAAAAAAAAAAATAAAAGTTGAATTATATATGGTCTTAAATG
AAAAATAAGACACGTGCAATGAATACAAGAAATTAAGTTTCTAAAACTAAGCGAATAGGT
AAATATATCAATTTTACCGTGTAAAGATCTAAGATCTTAATATTGATAATAGAAAATATT
TAAGTTACTTTCT

What is sequence processing?

Sequence processing refers to the broad field of techniques used to analyze ordered lists of data.



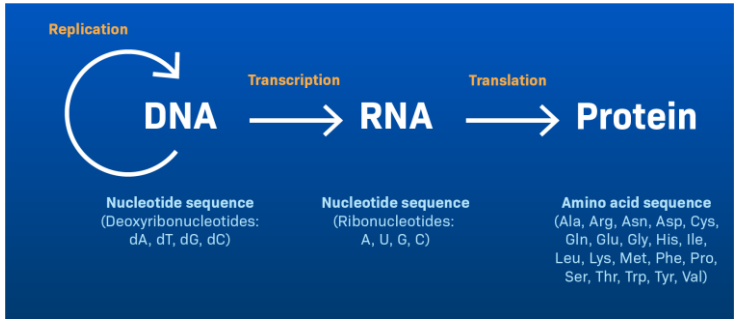


Sequence Processing in Bioinformatics

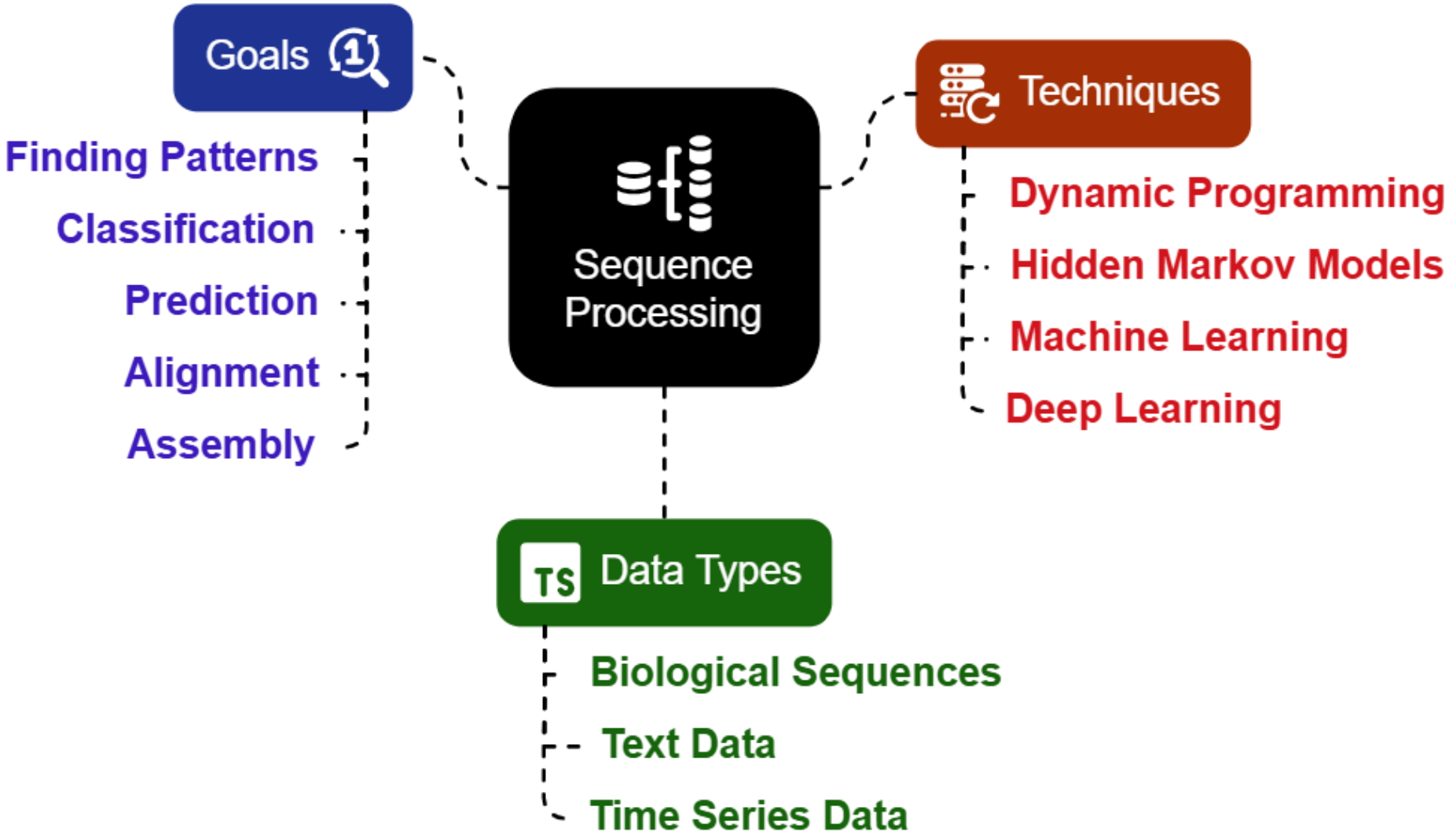
DNA Analysis
- Pattern Identification
- Genetic Information

RNA Analysis
- Transcription Processes
- Translation Processes

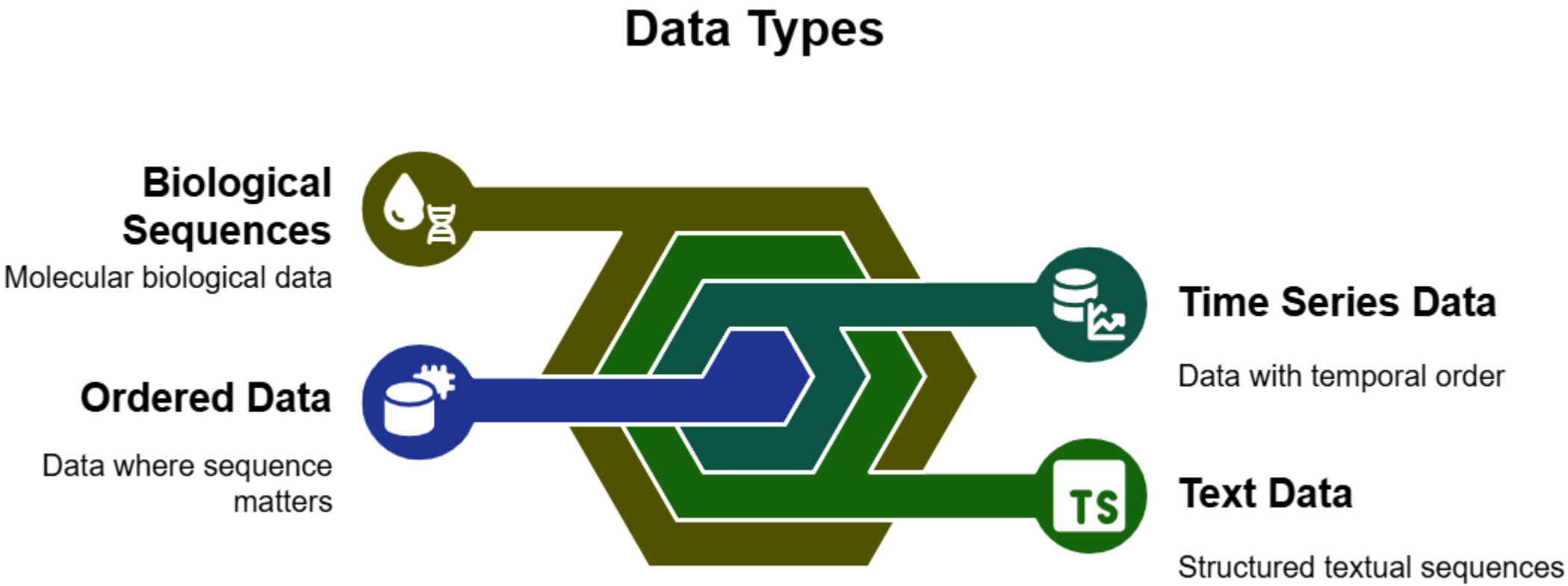
Protein Analysis
- Structural Analysis
- Functional Analysis



What is sequence processing?



Sequence Data Types ?



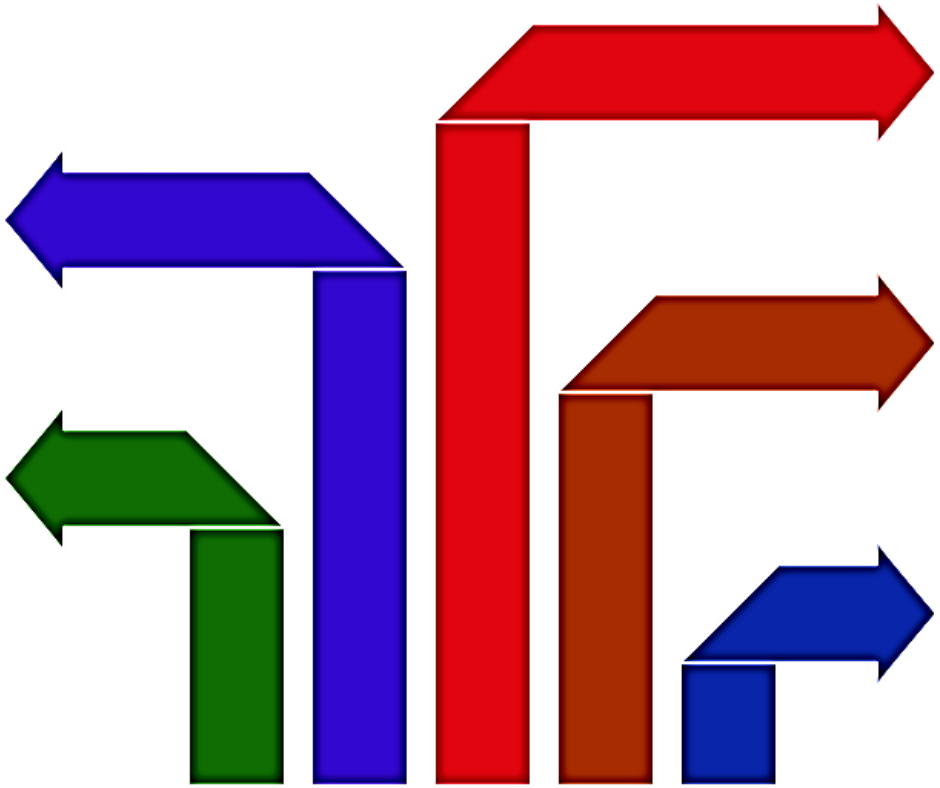
Goals of Sequence Processing?

Alignment

Compare multiple sequences to identify similarities and differences, like comparing DNA sequences across species.

Classification

Categorize a sequence based on its content, like classifying spam emails.



Assembly

Reconstruct a larger sequence from smaller fragments, such as assembling a genome from short DNA reads.

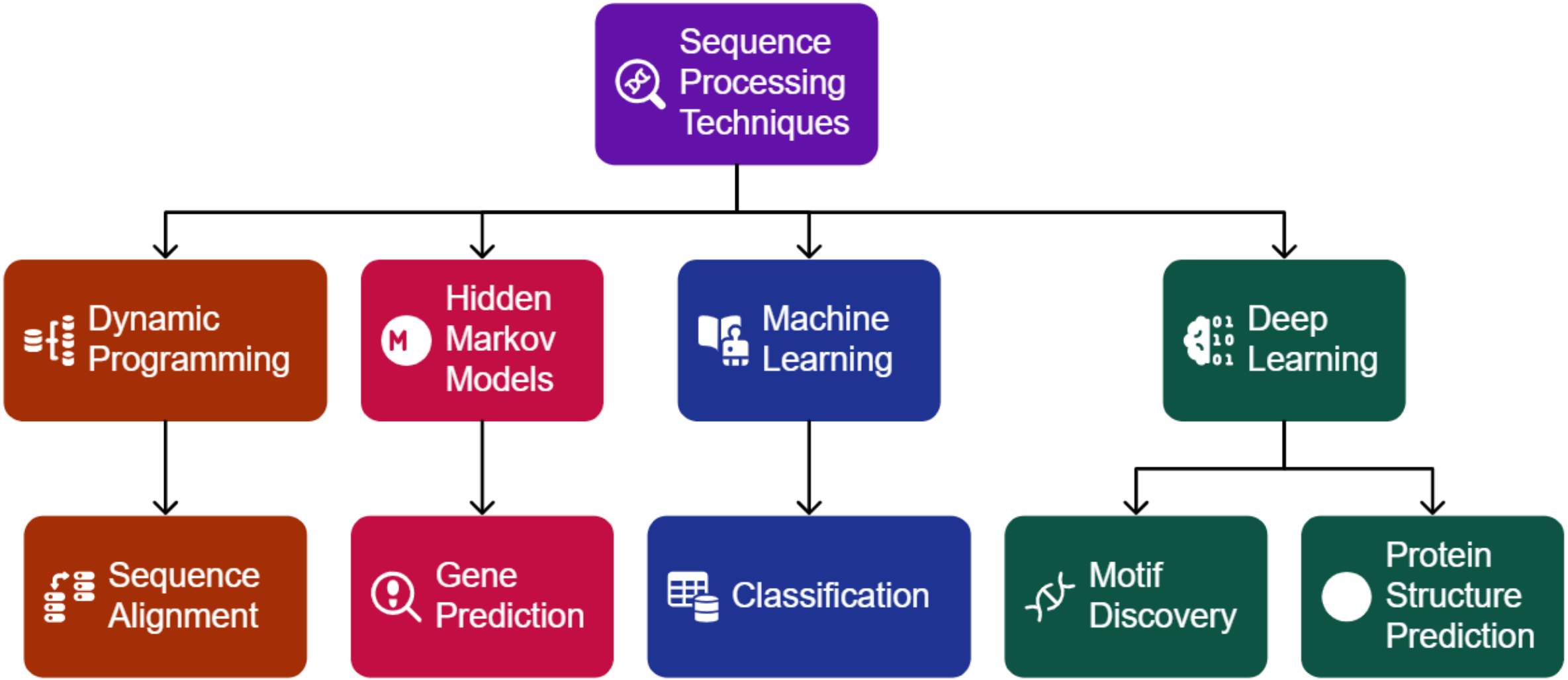
Prediction

Forecast the next element in a sequence, such as predicting the next word in a sentence.

Finding Patterns

Identify recurring motifs or structures within a sequence, such as specific genes in DNA.

Techniques of Sequence Processing?

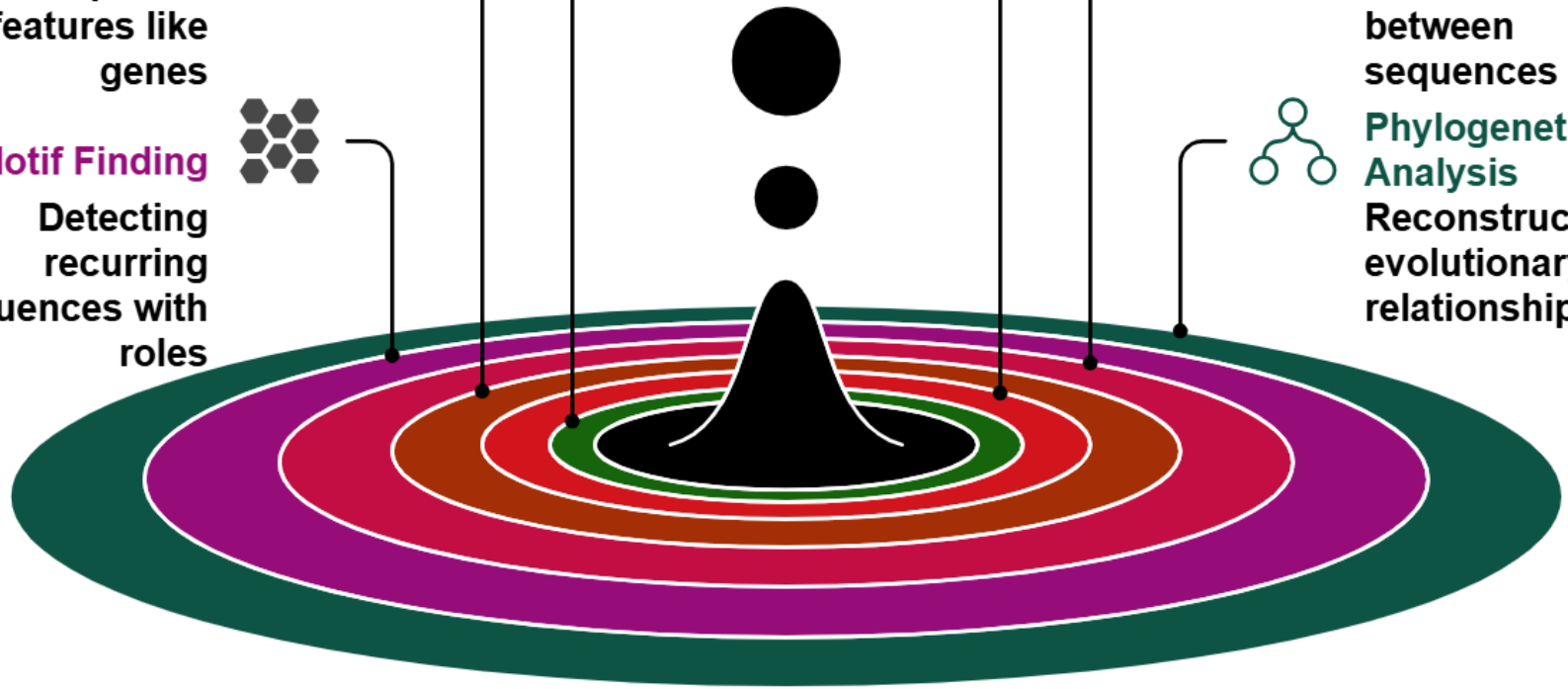


What are the main lines of sequence analysis?

Sequence Alignment
Arranging sequences to identify similarities

Annotation
Labeling sequence features like genes

Motif Finding
Detecting recurring sequences with roles

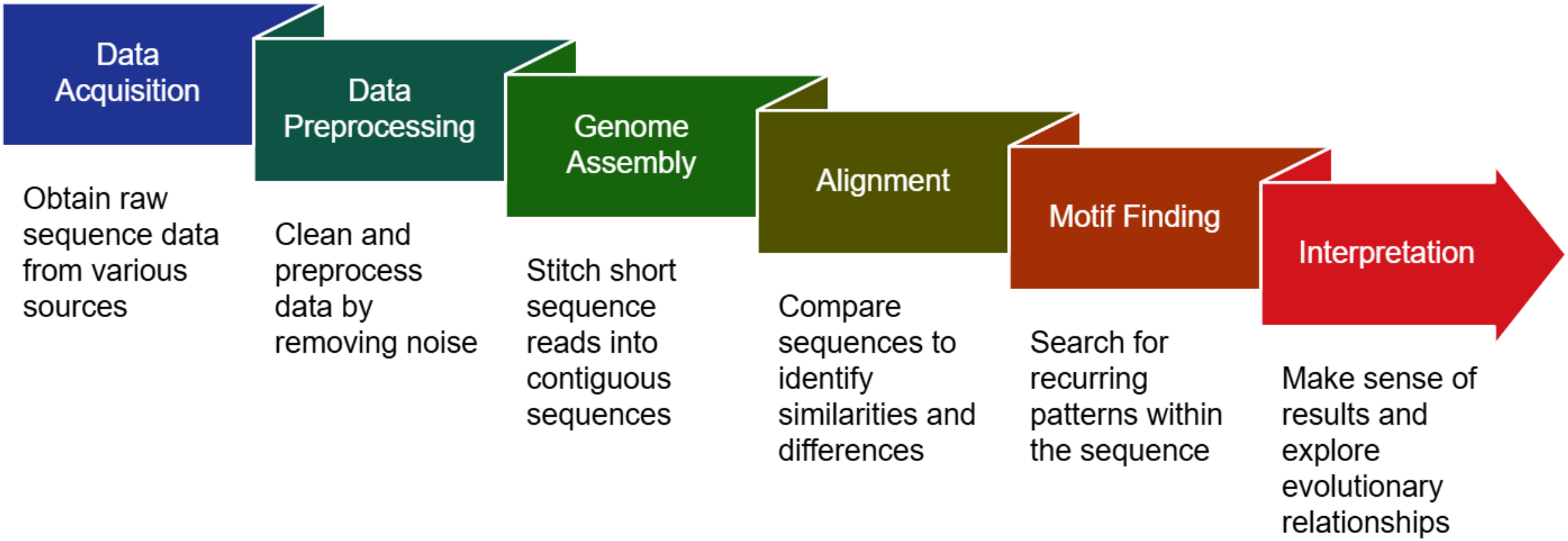


Assembly
Reconstructing long sequences from fragments

Variant Calling
Identifying differences between sequences

Phylogenetic Analysis
Reconstructing evolutionary relationships

What are the key steps of sequence analysis?



Comprehensive questions

1. What is a sequence?
2. How does sequence looks like?
3. What is sequence processing?
4. What are the main lines of sequence analysis?
5. What are the key steps of sequence analysis?

THANK YOU!