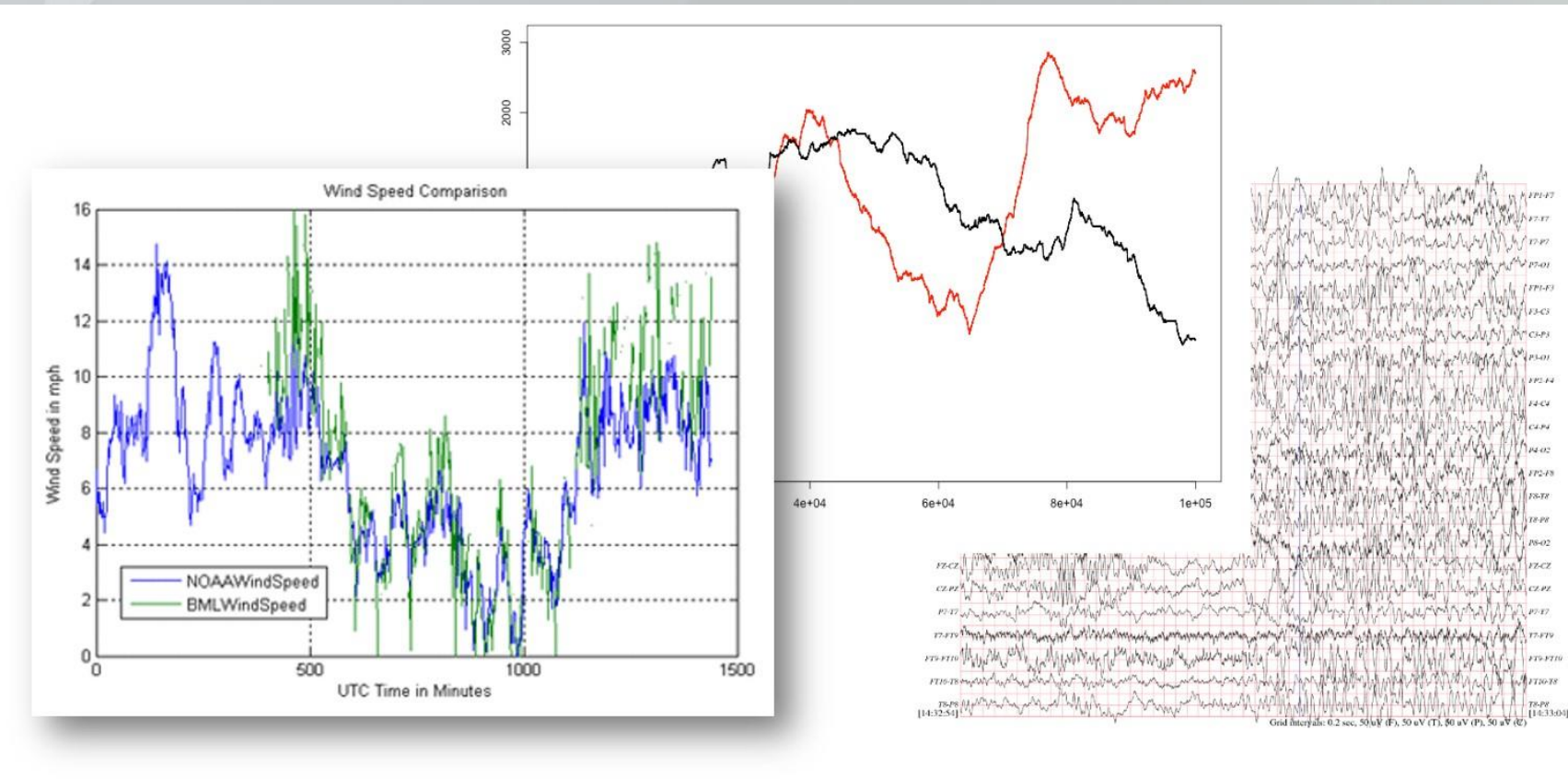


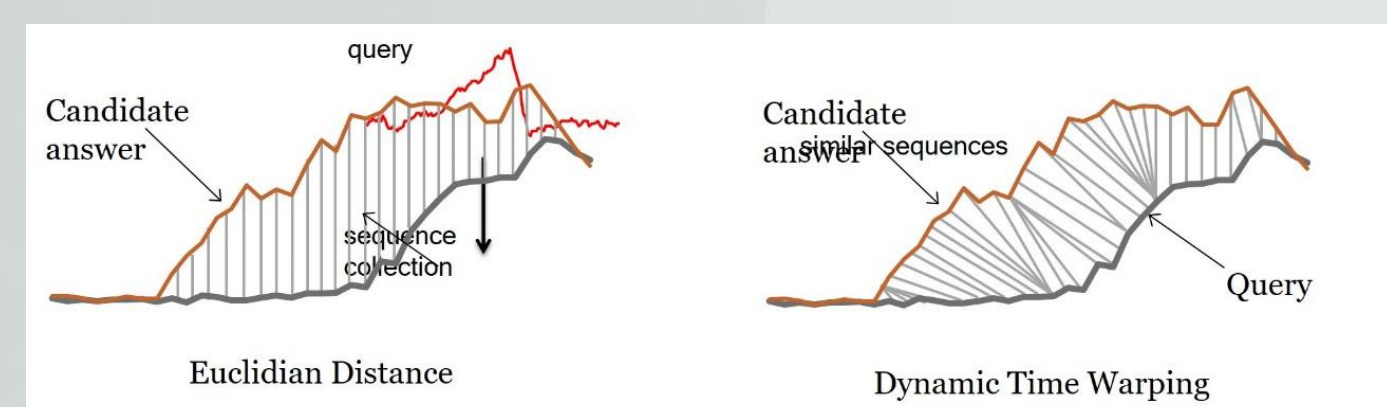
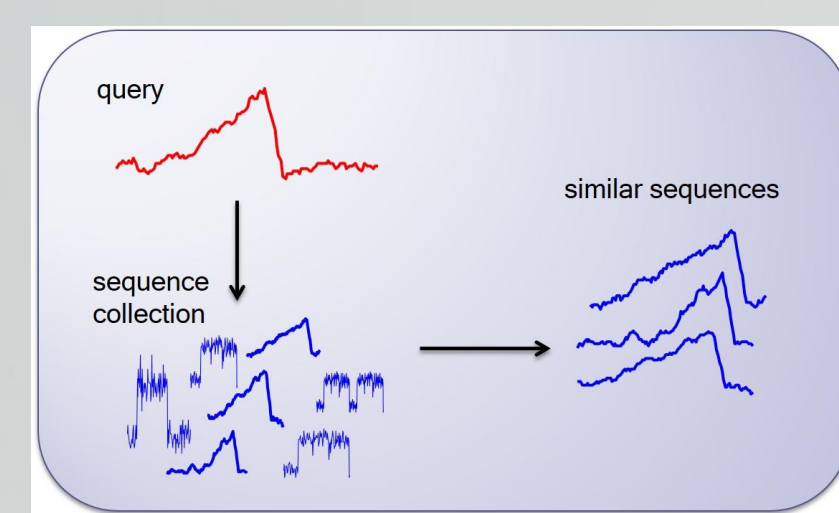
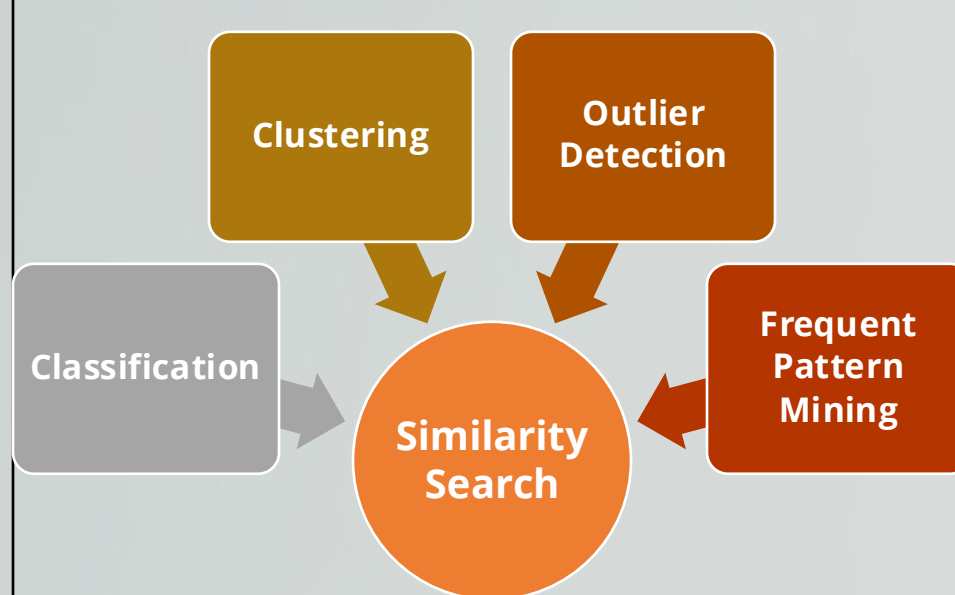
DATA SERIES



Appear in many scientific fields:

- seismology and earth sciences,
- finance
- astrophysics, neuroscience,
- engineering, etc.

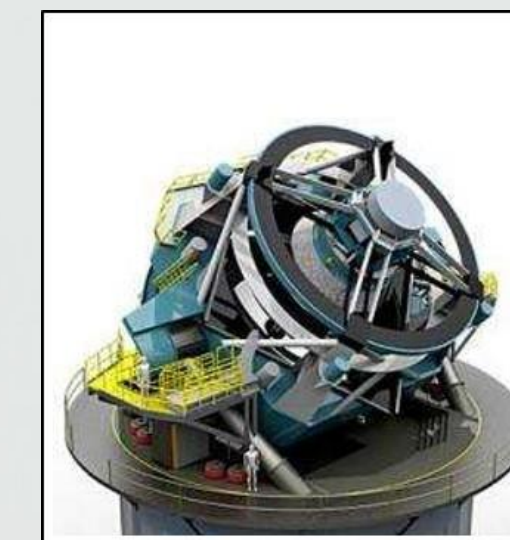
COMPLEX ANALYTICS



Similarity Search

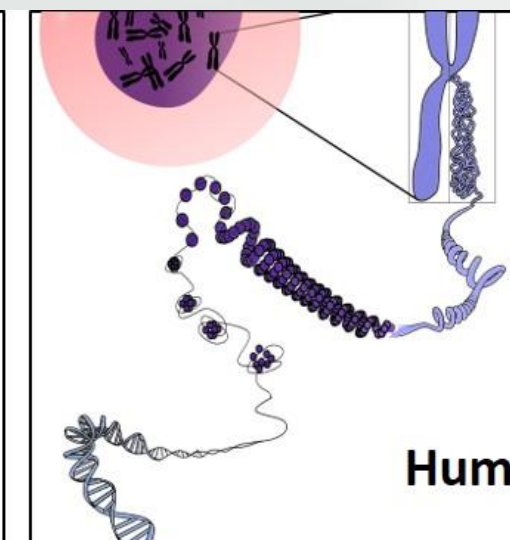
Identify the series from the collection with the smallest distance to the query series

MAIN CHALLENGE



NASA's Solar Observatory
1.5 TB per day

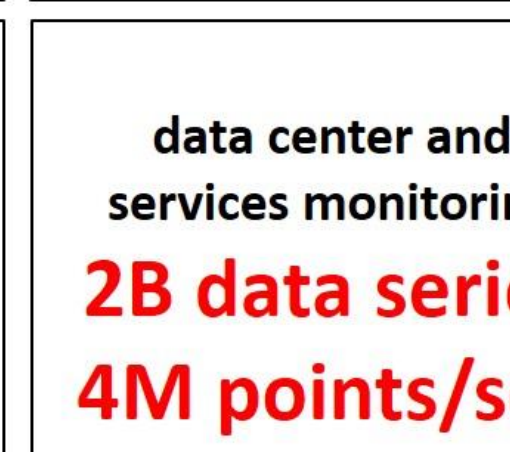
Large Synoptic Survey Telescope (2019)
~30 TB per night



Human Genome project
130 TB



passenger aircraft
20 TB per hour



data center and services monitoring
2B data series
4M points/sec



- Massive data series collections
- Data in multiple formats (audio, video, text)
- High-dimensional embeddings

HARSH Objectives and Methodology

OBJECTIVES

1. Multimodal Learning

1. Advanced learning-based models for encoding text and images
2. Kernels for image to keyword decoding
3. Hardware-aware methods to accelerate the data processing pipeline

2. Hardware-Aware/Hardware-Supported Data Series Processing utilizing the full computational power of modern computing platforms in an agnostic way

1. Communication and synchronization primitives for hardware-aware computation in heterogeneous platforms
2. Hardware-Aware Algorithms and Data Structures
3. Adaptive and agnostic data series processing

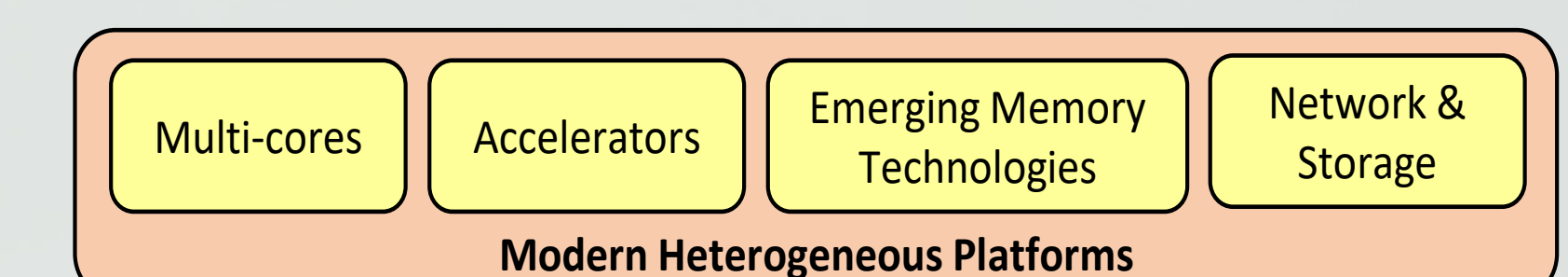
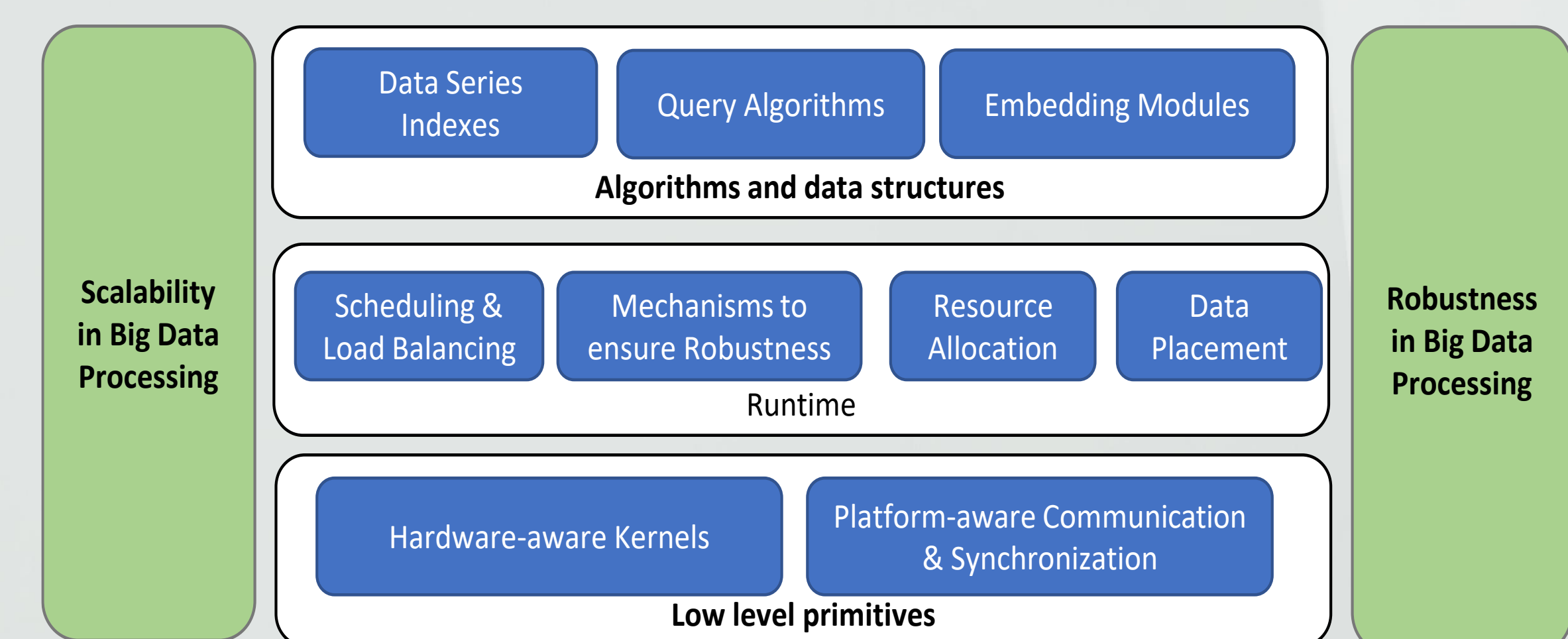
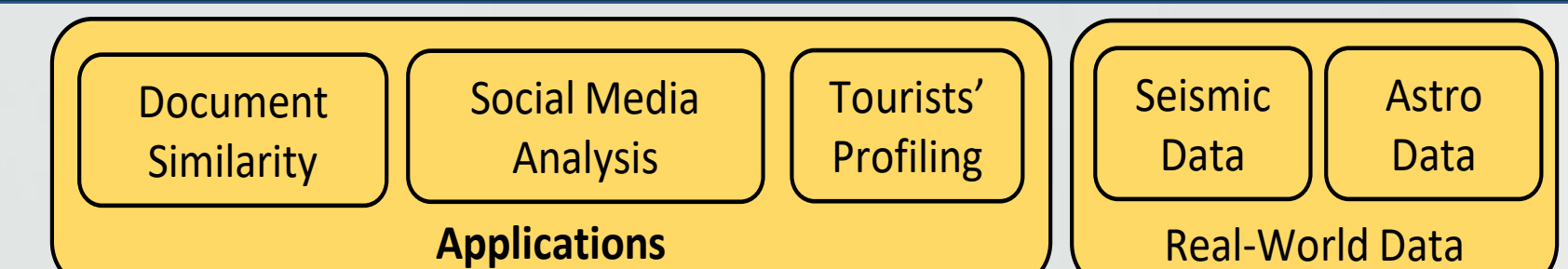
3. Dynamic Data Series Processing

USE CASES

- Use case 1 – Similar Document/File Finding Application.
- Use Case 2 – Photo Analysis for Travel Profile Enhancement Application.
- Use case 3 – Public Opinion Analysis Application.

Economic Impact

- Domains that are aggressive data series producers
 - Construction of EU E-ELT telescope3: 1 billion €
 - EU Human Brain Project5: estimated 1.19 billion €
 - US Human Genome Project has a \$796 billion impact and created 310,000 jobs)
- Relevant Markets
 - Tourism Market (one of the fastest rising markets in Greece)
 - Natural Language Processing Market
 - Social Media Platforms market



HARSH Innovation & Impact

- Novel deep machine learning algorithms for the automated extraction of key features through low dimensional embeddings
- Robust Hardware-aware Data Processing Systems
- Novel data structures and algorithms for large-scale data-series processing.

