Software Applications

- Software may be applied in any situation for which a pre-specified set of procedural steps (i.e., an algorithm) has been defined.
- **Information content** and **determinacy** are important factors in determining the nature of a software application.

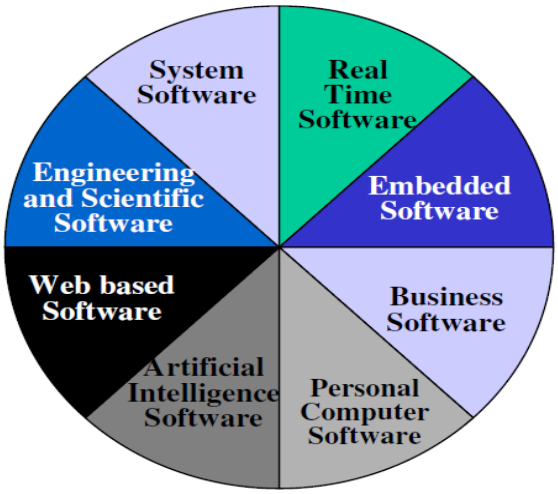
Content:

- Content refers to the meaning and form of incoming and outgoing information.
- For example, many business applications use highly structured input data (e.g., a database) and produce formatted "reports."
- Software that controls an automated machine (e.g., a numerical control) accepts discrete data items with limited structure and produces individual machine commands in rapid succession.

Information determinacy: There are two types of determinacy:
Determinate and Inderminate:

- *Information determinacy* refers to the predictability of the order and timing of information.
- An engineering analysis program accepts data that have a predefined order, executes the analysis algorithm(s) without interruption, and produces resultant data in report or graphical format. Such applications are **determinate**.
- A multiuser operating system, on the other hand, accepts inputs that have varied content and arbitrary timing, executes algorithms that can be interrupted by external conditions, and produces output that varies as a function of environment and time.
- Applications with these characteristics are **indeterminate**.

The following software areas indicate the breadth of potential applications:



1. System software:

- System software is a collection of programs for providing service to other programs.
- Other system applications (e.g., operating system components, drivers, telecommunications processors) process largely indeterminate data.
- In either case, the system software area is characterized by:
  - heavy interaction with computer hardware;

- heavy usage by multiple users;
- concurrent operation that requires scheduling, resource sharing, and sophisticated process management;
- complex data structures; and
- multiple external interfaces.

2. Real-time software:

- Software for the monitors/analyzes/controls real-world events as they occur is called real time.
- Elements of real-time software include:
  - a data-gathering component that collects and formats information from an external environment,
  - an analysis component that transforms information as required by the application,
  - a control/output component that responds to the external environment, and
  - a monitoring component that coordinates all other components so that real-time response can be maintained.

3. Business software:

- Business information processing is the largest single software application area.
- In a broad sense, business software is integrated software and has many components related to a particular field of the business.
- Discrete "systems" for example, payroll, accounts receivable/payable, inventory have evolved into management information system (MIS) software that accesses one or more large databases containing business information.
- Applications in this area restructure existing data in a way that facilitates business operations or management decision-making.
- In addition to conventional data processing application, business software applications also encompass interactive computing.

4. Engineering and scientific software:

Engineering and scientific software have been characterized by "number crunching" algorithms. Applications range from astronomy to volcano logy, from automotive stress analysis to space shuttle orbital dynamics, and from molecular biology to automated manufacturing.

However, modern applications within the engineering/scientific area are moving away from conventional numerical algorithms.

Computer-aided design, system simulation, and other interactive applications have begun to take on real-time and even system software characteristics.

5. Embedded software:

- Embedded software resides in read-only memory and is used to control products and systems for the consumer and industrial markets.
- Embedded software can perform very limited and esoteric functions (e.g., keypad control for a microwave oven) or provide significant function and control capability (e.g., digital functions in an automobile such as fuel control, dashboard displays, and braking systems).

6. Personal computer software:

- The personal computer is the type of computer, which gave revolution to the information technology.
- The personal computer software market has burgeoned over the past two decades.
- Word processing, spreadsheets, computer graphics, multimedia, entertainment, database management, personal and business financial applications, external network, and database access are only a few of hundreds of applications.

7. Web-based software:

The Web pages processed by the browser are the software that incorporates executable instructions (e.g., CGI, HTML, PERL, or Java), and data (e.g. hypertext and a variety of visual and audio formats). In essence, the network becomes a massive computer providing an almost unlimited software resource that can be accessed by anyone with a modem.

8. Artificial intelligence software:

- Artificial intelligence (AI) software is the software, which thinks and behaves like a human.
- AI software makes use of non-numerical algorithms to solve complex problems that are not amenable to computation or straightforward analysis.
- Expert systems, also called knowledge-based systems, pattern recognition (image and voice), artificial neural networks, theorem proving, and game playing are representative of applications within this category.