# Modern Application Development - I

Revision session (Week 7-12)

# Backend Systems

- Types of storage elements and their place in memory hierarchy
- Storage Parameters:
    - Latency
    - Throughput
    - Density
- Computer organization stating roles of each memory unit
- Cold Storage: Properties, Uses and examples
- Memory and Application Development
- Data Search: Algorithmic complexity and how they are used to locate an element in memory with the help of use cases

- Alternatives: binary search trees
- Database Search: Indexing
- SQL vs. NoSQL
- Relational databases and Alternatives.
    - Document Database
    - Key-Value
    - Graphs
    - Time-series Databases
- ACID properties
- Scaling of an application and its types

# Application Frontends

- Frontend mechanisms:
    - HTML, CSS, JS
    - Frameworks for functional reuse
    - Load implications on client and server
    - Fully static pages and runtime HTML generations
    - Trade-offs between server-side rendering and cient-side rendering
- Asynchronous Updates with AJAX
- DOM and DOM manipulation with JS
- Browser and clients:
    - JavaScript engines: V8, SpiderMonkey
    - Machine clients

- Native Mode
- Client-Side computation:
    - Client-side Validation
        - Inbuilt HTML5 Form controls
        - JavaScript Validation
        - Captcha: preventing JS to automate Web pages
- Security Implications: Sand-boxing
- Overload and DoS

# Security

- Access Control:
  - Discretionary vs. Mandatory
  - Role Based
  - Attribute Based
  - Policies and Permissions
  - Principle of least Privilege
  - Enforcing
- Web based Mechanisms
  - Types of security check
  - HTTP basic Auth and Digest Authentication
  - Cookies
  - API Security
- Session Management
  - Types and security issues with Cookies
  - Flask-sessions
  - Flask-Login
- HTTPS
  - Used with HTTP POST and Cookies
  - Secure Sockets
  - Types of security
  - Chain of Trust
- Logs and Analysis
  - Server logging
  - Application level Logging

# Testing

- Application testing
  - Static vs. Dynamic
  - White-box testing
  - Black-box testing
  - Grey-box testing
  - Regression
  - Coverage- statement, function, branch, condition
- Levels of Testing
- Requirements gathering
- Functional vs. Non-functional

- Unit Testing
- Integration Testing
- System Level Testing
- System Automation
- User Acceptance testing
- Abstract and Model-based testing
- GUI and Security testing
- pytest

# Beyond HTML

- HTML Evolution
  - Markup languages
  - SGML, HTML, XML, XHTML
  - HTML5
- JavaScript
  - What is JavaScript
  - why do we use it?
- Custom Elements
  - Web Components
    - Custom Elements
    - Shadow DOM
    - HTML Templates

- JavaScript Frameworks
  - Purpose of a framework
  - Types
    - ReactJs
    - AngularJs
    - VueJs
    - EmberJs

# Application Deployment

- Developing an App
  - Idea
  - Local development
  - Single computer
  - Multiple services
- Permanent Deployment
  - Dedicated servers
  - Always-on internet connection
  - Uninterrupted Power
  - Infrastructure
- Scaling
  - Logging
  - Load balancers

- Service Approach
  - SaaS
  - IaaS
  - Platform
  - PaaS
- Deployment
  - Version Control: manage changes in code
  - Centralized vs. Distributed
  - Continuous Integration
  - Continuous Delivery
- Containers
- Orchestration