

Course Summaries: UW Computer Science

CSE444

Course Description

CSE 444 covers the principles of database systems, including data models, query languages, and query processing. It emphasizes the relational model and introduces SQL.

Course Objectives

- Understand relational database theory and SQL syntax.
- Design normalized schemas and write complex queries.
- Explore database internals and optimization strategies.

Topics

- Relational algebra
- SQL
- Indexes
- Query optimization
- Transactions
- Database design

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CSE442

Course Description

CSE 442 is an introduction to the principles of data visualization. It explores how humans interpret visual encodings of information, and how to design visualizations for effective communication.

Course Objectives

- Learn design principles behind visual encodings and interaction techniques.
- Understand how to evaluate visualizations for usability.
- Build and critique interactive data visualizations.

Topics

- Visual perception
- Color theory
- Data types
- Marks & channels
- Dashboards
- D3.js

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CSE440

Course Description

CSE 440 introduces students to human-computer interaction (HCI), including techniques for user research, ideation, prototyping, and evaluation.

Course Objectives

- Conduct user-centered design research.
- Create low- and high-fidelity prototypes.
- Use evaluation methods to assess usability.

Topics

- Needfinding
- Storyboarding
- Paper prototypes
- Heuristic evaluation
- User testing
- Accessibility

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CSE431

Course Description

CSE 431 covers the theory of computation: models of computation, undecidability, and computational complexity.

Course Objectives

- Understand Turing machines and formal languages.
- Prove properties about regular, context-free, and recursively enumerable languages.
- Analyze complexity classes such as P and NP.

Topics

- Finite automata
- Regular expressions
- Pushdown automata
- Turing machines
- Decidability
- NP-completeness

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CSE428

Course Description

CSE 428 is a capstone course on building biomedical applications using large language models (LLMs).

Course Objectives

- Work in teams to design and prototype AI tools for healthcare.
- Gain experience with LLM APIs and prompt engineering.
- Understand ethical and deployment issues in biomedical NLP.

Topics

- Biomedical NLP
- ChatGPT API
- Prompt engineering
- Dataset annotation
- Project development

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CSE427

Course Description

CSE 427 provides an introduction to computational biology. Students will learn algorithmic techniques applied to biological data.

Course Objectives

- Apply algorithms to sequence alignment, genome assembly, and phylogenetics.
- Understand the biological motivation for algorithmic problems.
- Gain practical skills using tools like BLAST and Biopython.

Topics

- Sequence alignment
- Hidden Markov Models
- Genome assembly
- Motif finding
- Phylogenetic trees

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CSE426

Course Description

CSE 426 covers modern cryptography, including encryption, secure computation, and cryptographic proofs.

Course Objectives

- Design and analyze secure cryptographic protocols.
- Understand theoretical foundations like semantic security.
- Apply cryptography to real-world scenarios.

Topics

- One-time pad
- Block ciphers
- RSA
- Diffie-Hellman
- Zero-knowledge proofs
- Digital signatures

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CSE422

Course Description

CSE 422 introduces modern algorithm design, emphasizing algorithmic techniques for large, noisy data and ML/statistics foundations.

Course Objectives

- Understand tools from learning theory and dimensionality reduction.
- Apply hashing and approximation techniques to algorithmic problems.
- Explore advanced topics like spectral clustering and regularization.

Topics

- Consistent hashing
- Count-min sketch
- Similarity search
- Locality sensitive hashing
- Generalization theory
- Regularization
- PCA
- SVD
- Spectral clustering

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