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DIGIMAT - The No.1 Learning Management Platform for Creative Learning

NPTEL : Design and Analysis of Algorithms (Computer Science and Engineering)

Co-ordinators : Prof. Sundar Viswanathan, Prof. Ajit A Diwan, Prof. Abhiram G Ranade

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DIGIMAT - The No.1 Learning Management Platform for Creative Learning

NPTEL : NOC:Design and Pedagogy of the Introductory Programming Course (Computer Science and Engineering)

Co-ordinators : Prof. Abhiram G Ranade

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Lecture 28 - Correctness proof for GCD - Part 6

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- Lecture 33 - Loops in various applications - Part 1 : Loops in various applications brute force algorithms
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NPTEL : NOC:Introduction to Computer and Network Performance Analysis using Queuing Systems (Computer Science and Engineering)

Co-ordinators : Prof. Varsha Apte

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DIGIMAT - The No.1 Learning Management Platform for Creative Learning

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Co-ordinators : Prof.Arnab sarkar, Prof.Jatindra Kumar Deka, Dr. Santosh Biswas

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DIGIMAT - The No.1 Learning Management Platform for Creative Learning

NPTEL : NOC:Embedded Systems-Design Verification and Test (Computer Science and Engineering)

Co-ordinators : Prof.Jatindra Kumar Deka, Dr. Santosh Biswas, Prof.Arnab Sarkar

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DIGIMAT - The No.1 Learning Management Platform for Creative Learning

NPTEL : Theory of Computation (Computer Science and Engineering)

Co-ordinators : Prof. Somenath Biswas

Lecture 1 - What is theory of computation? Set membership problem, basic notions like alphabet, strings, formal languages

Lecture 2 - Introduction to finite automaton

Lecture 3 - Finite automata continued, deterministic finite automata (DFAs), language accepted by a DFA

Lecture 4 - Regular languages, their closure properties

Lecture 5 - DFAs solve set membership problems in linear time, pumping lemma

Lecture 6 - More examples of nonregular languages, proof of pumping lemma, pumping lemma as a game, converse of pumping lemma does not hold

Lecture 7 - A generalization of pumping lemma, nondeterministic finite automata (NFAs), computation trees for NFAs

Lecture 8 - Formal description of NFA, language accepted by NFA, such languages are also regular

Lecture 9 - 'Guess and verify' paradigm for nondeterminism

Lecture 10 - NFA's with epsilon transitions

Lecture 11 - Regular expressions, they denote regular languages

Lecture 12 - Construction of a regular expression for a language given a DFA accepting it. Algebraic closure properties of regular languages

Lecture 13 - Closure properties (Continued...)

Lecture 14 - Closure under reversal, use of closure properties

Lecture 15 - Decision problems for regular languages

Lecture 16 - About minimization of states of DFAs. Myhill-Nerode theorem

Lecture 17 - Continuation of proof of Myhill-Nerode theorem

Lecture 18 - Application of Myhill-Nerode theorem. DFA minimization

Lecture 19 - DFA minimization (Continued...)

Lecture 20 - Introduction to context free languages (cfls) and context free grammars (cfgs). Derivation of strings by cfgs

Lecture 21 - Languages generated by a cfg, leftmost derivation, more examples of cfgs and cfls

Lecture 22 - Parse trees, inductive proof that L is $L(G)$. All regular languages are context free

Lecture 23 - Towards Chomsky normal forms: elimination of useless symbols, analysis of reachable symbols, generating nonterminals, order of substeps matter

Lecture 24 - Simplification of cfgs continued, Removal of epsilon productions: algorithm and its correctness

Lecture 25 - Elimination of unit productions. Converting a cfg into Chomsky normal form. Towards pumping lemma for cfls

Lecture 26 - Pumping lemma for cfls. Adversarial paradigm

Lecture 27 - Completion of pumping lemma proof. Examples of use of pumping lemma. Converse of lemma does not hold. Closure properties of cfls

Lecture 28 - Closure properties continued. cfls not closed under complementation

Lecture 29 - Another example of a cfl whose complement is not a cfl. Decision problems for cfls

HTML Links for 1,19,200+ NPTEL Video Lectures, Created by LinuXpert Systems, Chennai

Lecture 30 - More decision problems. CYK algorithm for membership decision

Lecture 31 - Introduction to pushdown automata (pda)

Lecture 32 - pda configurations, acceptance notions for pdas. Transition diagrams for pdas

Lecture 33 - Equivalence of acceptance by empty stack and acceptance by final state

Lecture 34 - Turing machines (TM): motivation, informal definition, example, transition diagram

Lecture 35 - Execution trace, another example (unary to binary conversion)

Lecture 36 - Example continued. Finiteness of TM description, TM configuration, language acceptance, definition of recursively enumerable (r.e.) languages

Lecture 37 - Notion of non-acceptance or rejection of a string by a TM. Multitrack TM, its equivalence to standard TM. Multitape TMs

Lecture 38 - Simulation of multitape TMs by basic model. Nondeterministic TM (NDTM). Equivalence of NDTMs with deterministic TMs

Lecture 39 - Counter machines and their equivalence to basic TM model

Lecture 40 - TMs can simulate computers, diagonalization proof

Lecture 41 - Existence of non-r.e. languages, recursive languages, notion of decidability

Lecture 42 - Separation of recursive and r.e. classes, halting problem and its undecidability

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- Lecture 2 - Basic Notation and Convention, DFA Edit Lesson
- Lecture 3 - Example of DFAs
- Lecture 4 - Computation by DFA and Regular operation
- Lecture 5 - Introduction to Nondeterminism
- Lecture 6 - NFA, definition and examples
- Lecture 7 - Equivalence of NFA and DFA, Closure properties
- Lecture 8 - Regular expressions
- Lecture 9 - Algebraic properties, RE to NFA conversion
- Lecture 10 - GNFA to RE conversion
- Lecture 11 - More closure properties of regular languages
- Lecture 12 - Non-regular languages and pumping lemma
- Lecture 13 - Examples of non-regular languages
- Lecture 14 - DFA minimization
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- Lecture 16 - Examples of CFGs, Reg subset of CFL
- Lecture 17 - Parse tree, derivation, ambiguity
- Lecture 18 - Normal forms, Chomsky normal form
- Lecture 19 - Non-CFLs, pumping lemma
- Lecture 20 - Examples of non- CFLs
- Lecture 21 - Pushdown Automata
- Lecture 22 - Pushdown Automata - Definition and Example
- Lecture 23 - Pushdown Automata - Examples and Relation with CFGs
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- Lecture 25 - Deterministic Context Free Languages
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- Lecture 27 - More on Turing Machine
- Lecture 28 - Non deterministic Turing Machine Edit Lesson
- Lecture 29 - Configuration Graphs
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Lecture 8 - Rings : Failure of Unique Factorization

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Lecture 10 - Rings : Ideal Arithmetic

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Lecture 5 - Hadoop MapReduce 1.0

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Lecture 17 - CQL (Cassandra Query Language)

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Lecture 2 - Arithmetic complexity classes

Lecture 3 - Determinant is in VP

Lecture 4 - Determinant vs Arithmetic Branching Programs (ABP)

Lecture 5 - Determinant as signed sum of cflow sequence

Lecture 6 - Determinant has small ABP and Strassen's homogenization

Lecture 7 - Depth reduction for arithmetic formulas

Lecture 8 - Depth reduction for arithmetic circuits

Lecture 9 - Depth 4 reduction

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Lecture 12 - Width-2 ABP Chasm

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Lecture 16 - Lower Bound for Constant depth Multilinear Circuits

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Lecture 25 - Amplified version of Valiant-Vazirani Theorem

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Lecture 5 - ACC0 Lower Bounds

Lecture 6 - ACC0 Lower Bounds (Continued...)

Lecture 7 - Monotone Circuits

Lecture 8 - Monotone Circuit Lower Bound and Sunflower Lemma

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Lecture 11 - Expanders

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Lecture 16 - Undirected Path in logspace

Lecture 17 - Explicit Prg to derandomizing classes

Lecture 18 - Hardness vs Randomness

Lecture 19 - Hardness to NW-Generator to PRG

Lecture 20 - Partial derandomization from worst-case hardness of permanent

Lecture 21 - Error-correcting codes

Lecture 22 - Introduction to various linear explicit codes

Lecture 23 - Introduction of efficient decoding

Lecture 24 - Local decoding of WH, Reed-Muller and Concatenated codes

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- Lecture 2 - Examples and Course outline
- Lecture 3 - Probability over discrete space
- Lecture 4 - Inclusion-Exclusion principle
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- Lecture 6 - Conditional probability, Partition formula
- Lecture 7 - Independent events, Bayes theorem
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- Lecture 9 - Expectation
- Lecture 10 - Conditional Expectation
- Lecture 11 - Important Random Variables
- Lecture 12 - Continuous Random Variables
- Lecture 13 - Equality Checking, Poisson Distribution
- Lecture 14 - Concentration Inequalities, Variance
- Lecture 15 - Weak Linearity of Variance, Law of Large Numbers
- Lecture 16 - Chernoff's Bound. K-wise Independence
- Lecture 17 - Union and Factorial Estimates
- Lecture 18 - Stochastic Process: Markov Chains
- Lecture 19 - Drunkard's walk, Evolution of Markov Chains
- Lecture 20 - Stationary Distribution
- Lecture 21 - Perron-Frobenius Theorem, Page Rank Algorithm
- Lecture 22 - Page Rank Algorithm: Ergodicity
- Lecture 23 - Cell Genetics
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Lecture 14 - Upper and Lower Bounds on the Andreev Function

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Lecture 17 - Circuits for Addition - Parallel Prefix Sum Method

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Lecture 20 - Basic Circuit for Division using Newton-Raphson Method

Lecture 21 - Division in NC1 (Beame, Cook, Hoover Theorem) - I

Lecture 22 - Division in NC1 (Beame, Cook, Hoover Theorem) - II

Lecture 23 - Division in NC1 (Beame, Cook, Hoover Theorem) - III

Lecture 24 - Division in NC1 (Beame, Cook, Hoover Theorem) - IV

Lecture 25 - Division in NC1 (Beame, Cook, Hoover Theorem) - V

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Lecture 27 - Relation between Bounded Depth Circuit Classes and Uniform Complexity Classes - I

Lecture 28 - Relation between Bounded Depth Circuit Classes and Uniform Complexity Classes - II

Lecture 29 - Reducing Circuit Depth

Lecture 30 - P is in P/poly

Lecture 31 - Discussion on Lower Circuit Bounds for Bounded Depth Circuit Classes

- Lecture 32 - Monotone Circuit Lower Bound for Clique (Razborov's Theorem) - I
- Lecture 33 - Monotone Circuit Lower Bound for Clique (Razborov's Theorem) - II
- Lecture 34 - Monotone Circuit Lower Bound for Clique (Razborov's Theorem) - III
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- Lecture 38 - Circuit Lower Bound for Parity by Approximating Circuits using Polynomials (Razborov-Smolensky Theorem) - I
- Lecture 39 - Circuit Lower Bound for Parity by Approximating Circuits using Polynomials (Razborov-Smolensky Theorem) - II
- Lecture 40 - Circuit Lower Bound for Parity by Approximating Circuits using Polynomials (Razborov-Smolensky Theorem) - III
- Lecture 41 - Circuit Lower Bound for Parity using Switching Lemma (Hastad's Theorem)
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- Lecture 44 - Proof of Hastad's Switching Lemma - I
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- Lecture 46 - Communication Complexity of a Function
- Lecture 47 - Relation Between Communication Complexity and Circuit Depth (Karchmer-Wigderson Theorem) - I
- Lecture 48 - Relation Between Communication Complexity and Circuit Depth (Karchmer-Wigderson Theorem) - II
- Lecture 49 - Bounded Width Branching Programs = NC1 (Barrington's Theorem) - I
- Lecture 50 - Bounded Width Branching Programs = NC1 (Barrington's Theorem) - II
- Lecture 51 - Width 3 Branching Programs = MOD3 o MOD2 Circuits (Barrington's Theorem) - I
- Lecture 52 - Width 3 Branching Programs = MOD3 o MOD2 Circuits (Barrington's Theorem) - II
- Lecture 53 - Uniform AC0 can be simulated by depth 3 Threshold circuits of quasipolynomial size (Allender-Hertramph Theorem) - I
- Lecture 54 - Uniform AC0 can be simulated by depth 3 Threshold circuits of quasipolynomial size (Allender-Hertramph Theorem) - II
- Lecture 55 - Valient-Vazirani Theorem - I
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- Lecture 57 - Natural Proof Barrier (Razborov-Rudich Theorem) - I
- Lecture 58 - Natural Proof Barrier (Razborov-Rudich Theorem) - II
- Lecture 59 - Pseudorandom Function Generator by Goldreich, Goldwasser and Micali - I
- Lecture 60 - Pseudorandom Function Generator by Goldreich, Goldwasser and Micali - II

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Lecture 3 - Introduction to IoT Platform

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Lecture 13 - Task Offloading Based on LSTM Prediction and Deep Reinforcement Learning

Lecture 14 - Vertical and Horizontal Offloading for Cloud Edge

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- Lecture 3 - Gaussian Elimination with Examples
- Lecture 4 - Summary of Gaussian Elimination
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- Lecture 6 - Linear Operators
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- Lecture 8 - Resource Allocation as LP
- Lecture 9 - Approximate Degree as LP
- Lecture 10 - Equivalent LP's
- Lecture 11 - Introduction to Convexity
- Lecture 12 - Different Kind of Convex Sets
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- Lecture 18 - BFS and Vertices
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- Lecture 20 - Details of Simplex Algorithm
- Lecture 21 - Starting BFS
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- Lecture 24 - Hyperplane Separation Theorems
- Lecture 25 - Farkas Lemma
- Lecture 26 - How to take dual
- Lecture 27 - Examples of taking dual
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- Lecture 29 - Proof of Strong Duality
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Lecture 15 - NDTM Hierarchy

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Lecture 22 - $NL = coNL$

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Lecture 28 - Permanent and its Cycle cover of a Graph

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Lecture 41 - GNI is in BP.NP

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Lecture 43 - GI is NP-hard (Continued...) Going Beyond TMs

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Lecture 16 - Divisor Class Group

Lecture 17 - Genus of a curve

Lecture 18 - Riemann-Roch and Adeles

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Lecture 21 - Jacobian of a curve

Lecture 22 - Zeta function of curves

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Co-ordinators : Prof. Sudeshna Sarkar, Prof. Anupam Basu

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Co-ordinators : Prof. Soumya Kanti Ghosh

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Co-ordinators : Dr. Balaraman Ravindran

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- Lecture 38 - Lecture 2 - Classes and objects in Python
- Lecture 39 - Lecture 3 - User defined lists
- Lecture 40 - Lecture 4 - Search trees
- Lecture 41 - Lecture 1 - Memoization and dynamic programming
- Lecture 42 - Lecture 2 - Grid paths
- Lecture 43 - Lecture 3 - Longest common subsequence
- Lecture 44 - Lecture 4 - Matrix multiplication
- Lecture 45 - Lecture 5 - Wrap-up, Python vs other languages

Lecture 1 - Intro to Course

Lecture 2 - Intro to Course

Lecture 3 - Incidents

Lecture 4 - Tutorial 1 - Part 1 Ubuntu

Lecture 5 - Tutorial 1 - Part 2 Python

Lecture 6 - OSM APIs and tools for data collection

Lecture 7 - Tutorial 2 - Part 1 Facebook API

Lecture 8 - Tutorial 2 - Part 2 Facebook API

Lecture 9 - Trust and Credibility on OSM

Lecture 10 - Misinformation on Social Media

Lecture 11 - Privacy and Social Media

Lecture 12 - Tutorial 3 - Part 1 Twitter API

Lecture 13 - Tutorial 3 - Part 2 MySQL

Lecture 14 - Tutorial 3 - Part 3 MongoDB

Lecture 15 - Privacy and Pictures on Online Social Media

Lecture 16 - Policing and Online Social Media

Lecture 17 - Policing and Online Social Media

Lecture 18 - Policing and Online Social Media

Lecture 19 - eCrime on Online Social Media

Lecture 20 - eCrime on Online Social Media

Lecture 21 - Tutorial 4 - Social Network Analysis

Lecture 22 - Link Farming in Online Social Media

Lecture 23 - Nudges

Lecture 24 - Semantic attacks: Spear phishing

Lecture 25 - Tutorial 5 - Analyzing text using Python NLTK

Lecture 26 - Profile Linking on Online Social Media

Lecture 27 - Anonymous Networks

Lecture 28 - Tutorial 6 - Gephi Network Visualization

Lecture 29 - Privacy in Location Based Social Networks - Part 1

Lecture 30 - Privacy in Location Based Social Networks - Part 2

Lecture 31 - Tutorial 7 - Visualization - Highcharts

DIGIMAT - The No.1 Learning Management Platform for Creative Learning

[Lecture 32 - Beware of What You Share Inferring Home Location in Social Networks](#)

[Lecture 33 - On the dynamics of username change behavior on Twitter](#)

[Lecture 34 - Boston Marathon Analyzing Fake Content on Twitter](#)

Lecture 1 - Java Basics

Lecture 2 - Java : Primitive Data Types, Strings, Loops, Conditional Statements

Lecture 3 - Java : Strings, OOP principles

Lecture 4 - Java : Interfaces

Lecture 5 - Java : Classes, Exceptions, Threads

Lecture 6 - Introduction to Android Studio

Lecture 7 - Your First App

Lecture 8 - Deploying your App to a Phone

Lecture 9 - Extending app - Buttons, Toast

Lecture 10 - Android Development Environment

Lecture 11 - User Interface

Lecture 12 - Application Fundamentals

Lecture 13 - Extending the application

Lecture 14 - Activity Lifecycle - I

Lecture 15 - Activity Lifecycle - II

Lecture 16 - Activity LifeCycle - III

Lecture 17 - Adding Icon, Layouts, Handling Rotation - I

Lecture 18 - Adding Icon, Layouts, Handling Rotation - II

Lecture 19 - Debugging

Lecture 20 - Intents - I

Lecture 21 - Intents - II

Lecture 22 - Observer Pattern

Lecture 23 - Fragments - I

Lecture 24 - Fragments - II

Lecture 25 - Fragment Basic Programming Example

Lecture 26 - Fragments - Advanced Example

Lecture 27 - Implicit Intents

Lecture 28 - Saving Data - I

Lecture 29 - Saving Data - II

Lecture 30 - Security and System Permissions

Lecture 31 - Services

[Lecture 32 - Processes and threads](#)

[Lecture 33 - Working with Fragments - I](#)

[Lecture 34 - Working with Fragments - II](#)

[Lecture 35 - Working with Fragments - III](#)

[Lecture 36 - RecyclerView, Adapter](#)

[Lecture 37 - RecyclerView, Adapter, ViewHolder](#)

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[Lecture 39 - Dialogues](#)

Lecture 1 - Introduction to the course

Lecture 2 - Introduction to a web-app

Lecture 3 - Building a web-app

Lecture 4 - Networks

Lecture 5 - Practical - Running your own web-server

Lecture 6 - Protocols

Lecture 7 - Practical - SSH + Network experiments

Lecture 8 - Practical - Building a webapp with nodejs and using git. Introduction to reverse proxies.

Lecture 9 - Practical - Introduction to server-side javascript and HTML/CSS

Lecture 10 - Introduction to client-side Javascript

Lecture 11 - Practical - APIs and mobile apps use web-servers

Lecture 12 - Introduction to databases

Lecture 13 - Data modelling and constraints

Lecture 14 - Interacting with a DBMS

Lecture 15 - Practical - Deeper exploration of a DBMS (column types and more)

Lecture 16 - Introduction to SQL

Lecture 17 - Understanding database performance

Lecture 18 - Transactions and ACID properties

Lecture 19 - Database security, backup and recovery

Lecture 20 - Analytics and Views

Lecture 21 - Scaling a database

Lecture 22 - Connecting your webapp to your database and SQL Injection

Lecture 23 - SQL and NoSQL systems

Lecture 24 - Authentication with HTTP

Lecture 25 - Understanding security, and some best practices for webapps

Lecture 26 - Introduction to authentication, hashing, curl and sessions

Lecture 27 - Introduction to mobile apps

Lecture 28 - Introduction to Mobile Application Development Part 2

Lecture 29 - Introduction to Android

Lecture 30 - Getting started with Android Application Development

Lecture 31 - Building Custom UI using XML and Logs

[Lecture 32 - Building a Blog App](#)

[Lecture 33 - Deploying an app to the Google Play Store](#)

[Lecture 34 - Introduction to iOS](#)

[Lecture 35 - The API Economy](#)

[Lecture 36 - Version Control using Git](#)

[Lecture 37 - Backend Architectures](#)

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Lecture 2 - Storage Hierarchy, Exceptions, Interrupts and traps

Lecture 3 - OS Management Services

Lecture 4 - OS Security Issues

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Lecture 6 - Process Scheduling

Lecture 7 - Scheduling Algorithm

Lecture 8 - Process Synchronization

Lecture 9 - Memory Management - 1

Lecture 10 - Memory Management - 2

Lecture 11 - File Systems - 1

Lecture 12 - File Systems - 2

Lecture 13 - Unix Filesystem

Lecture 14 - Unix Filesystem (Continued...)

Lecture 15 - Linux: Basic Commands

Lecture 16 - Linux: Basic Commands (Continued...)

Lecture 17 - Linux: Users and Permissions

Lecture 18 - Linux: I/O Redirection and Pipes

Lecture 19 - Linux: Task Control

Lecture 20 - Linux: Shell Environment

Lecture 21 - Linux: Text Editors

Lecture 22 - Linux: Compression / Archiving

Lecture 23 - Linux: Print and Sync Commands

Lecture 24 - Linux: File Comparison

Lecture 25 - Basic Networking Administration

Lecture 26 - Filesystems and Devices

Lecture 27 - Shell Introduction

Lecture 28 - Shell Comments and Variables

Lecture 29 - Shell Variables

Lecture 30 - Shell Arrays and Arithmetic

Lecture 31 - Shell Condition and Relation

[Lecture 32 - Shell Examples](#)

[Lecture 33 - Shell Functions](#)

[Lecture 34 - Shell File Test](#)

[Lecture 35 - Shell Loop Control](#)

[Lecture 36 - Shell Script Variations](#)

[Lecture 37 - Shell Pattern Matching](#)

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[Lecture 39 - Shell Co-routines](#)

[Lecture 40 - Shell Signals and Traps](#)

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[Lecture 43 - Shell Examples 2](#)

[Lecture 44 - Shell Review](#)

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[Lecture 46 - Structure of a Network](#)

[Lecture 47 - Network Core - Definition](#)

[Lecture 48 - Network Access and Physical Media](#)

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[Lecture 50 - Network Protocol Layers](#)

[Lecture 51 - Network Devices](#)

[Lecture 52 - Network Security - An Introduction](#)

[Lecture 53 - Public Key Cryptography](#)

[Lecture 54 - Digital Signatures](#)

[Lecture 55 - Security in Practise](#)

[Lecture 56 - Security in Practise \(Continued...\)](#)

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[Lecture 58 - Snort](#)

[Lecture 59 - Review I](#)

[Lecture 60 - Review II](#)

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Lecture 2 - CSP Examples: Map colouring, N-Queens, Classroom scheduling

Lecture 3 - CSP Examples: Huffman-Clowes Labelling, Waltz Algorithm, Crosswords

Lecture 4 - Model Based Diagnosis - An application of CSP

Lecture 5 - Constraint Networks - An Introduction

Lecture 6 - Binary Constraint Networks (BCN), Equivalent Networks

Lecture 7 - Projection Networks

Lecture 8 - Constraint Propagation

Lecture 9 - Algorithms AC1 and AC3

Lecture 10 - Can we do better than AC3?

Lecture 11 - Algorithm AC4

Lecture 12 - Generalized AC, Path-Consistency

Lecture 13 - i-Consistency, Algorithm PC1

Lecture 14 - Algorithm PC2, Strong i-Consistency

Lecture 15 - Directional Consistency and Graph Ordering

Lecture 16 - Min-Width and Min-Induced-Width Ordering

Lecture 17 - Directional Arc-Consistency and Tree CSPs

Lecture 18 - Directional Path-Consistency and Directional i-Consistency

Lecture 19 - Backtrack-Free search and Adaptive Consistency

Lecture 20 - Adaptive Consistency: Bucket Elimination

Lecture 21 - Search Methods for Solving CSPs

Lecture 22 - Algorithm Backtracking

Lecture 23 - Look-Ahead Methods in Search

Lecture 24 - Look-Ahead Search: Examples

Lecture 25 - Combining Search with Reasoning: Algorithm DPLL

Lecture 26 - Algorithm Backmarking

Lecture 27 - Dynamic Value Ordering, Dynamic Variable Ordering

Lecture 28 - Look-Back Methods - Definitions

Lecture 29 - Gaschnig's Backjumping: The Culprit Variable

Lecture 30 - Gaschnig's Backjumping, Graph-Based Backjumping

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[Lecture 32 - Conflict-Directed Backjumping: Definitions](#)

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[Lecture 34 - Combining Look-Ahead and Look-Back: FC-CBJ](#)

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Lecture 2 - High Speed Circuit Design - Fast Adder Circuits

Lecture 3 - Lab 1 : Introduction

Lecture 4 - Fast Adder Circuits (Continued...)

Lecture 5 - Fast Multiplier Circuit

Lecture 6 - Fast Multiplier Circuit (Continued...)

Lecture 7 - Programming using X86 ISA - Addressing Modes

Lecture 8 - Programming using X86 ISA - Addressing Modes

Lecture 9 - Floating point - Precision and Accuracy

Lecture 10 - Floating Point - Addition, Subtraction and Multiplication

Lecture 11 - Instruction Set Architecture

Lecture 12 - Instruction Set Architecture (Continued...)

Lecture 13 - Lab 2 : Segmentation - Part I

Lecture 14 - Lab 2 : Segmentation - Part II

Lecture 15 - Lab 2 : Segmentation - Part III

Lecture 16 - Orthogonal ISA, C Constructs Mapping, Addressing Modes

Lecture 17 - Atomic and Predicated Instructions

Lecture 18 - Atomic and Predicated Instructions (Continued...)

Lecture 19 - General Purpose Registers

Lecture 20 - Expanding opcodes

Lecture 21 - Introduction to Pipelining

Lecture 22 - Pipelining

Lecture 23 - Data Hazards

Lecture 24 - Lab 2 : Instruction Scheduling - Static and Dynamic

Lecture 25 - Dynamic Instruction Scheduling

Lecture 26 - Dynamic Instruction Scheduling (Continued...)

Lecture 27 - Control Hazard, Branch Prediction

Lecture 28 - Process Management

Lecture 29 - Branch prediction

Lecture 30 - Global Branch Prediction

Lecture 31 - Structural Hazard, Architectural Enhancements

[Lecture 32 - Lab 3 : Virtual Memory](#)

[Lecture 33 - Locality of Reference, Demand paging](#)

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[Lecture 35 - Multilevel Paging, Translational Lookaside Buffer](#)

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[Lecture 38 - Page Frame Allocation, Beledy's Anomaly](#)

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[Lecture 42 - Cache - Cache Coherency, Dual Ported Cache](#)

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[Lecture 47 - Virtually Indexed - Virtually Tagged and Physically Tagged Caches](#)

[Lecture 48 - Lab 4 : Task Switching \(Continued...\)](#)

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[Lecture 50 - Concurrent Programming in Hardware - Part I](#)

[Lecture 51 - Concurrent Programming in Hardware - Part II](#)

[Lecture 52 - Conclusion : Recent Trends in Computer Organization and Architecture](#)

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Lecture 2 - Overview of Cellular Systems - Part 2

Lecture 3 - Overview of Cellular Systems - Part 3

Lecture 4 - 5G and other Wireless Technologies

Lecture 5 - Basic Cellular Terminology

Lecture 6 - Introduction to Antennas and Propagation Models

Lecture 7 - Link budget, Fading margin, Outage

Lecture 8 - Cellular Concept

Lecture 9 - Cellular system design and analysis

Lecture 10 - Cellular Geometry and System Design

Lecture 11 - Cellular System Capacity, Trunking

Lecture 12 - Handoff and Mobility

Lecture 13 - Handoff Part 2, Classification of Signal Variation

Lecture 14 - Shadowing, Outage, Multipath

Lecture 15 - Rayleigh Fading and Statistical Characterization

Lecture 16 - Properties of Rayleigh Distribution

Lecture 17 - BER in Fading, Narrowband vs Wideband Channels

Lecture 18 - Characterization of Multipath Fading Channels

Lecture 19 - Choice of Modulation

Lecture 20 - Coherent versus Differential Detection

Lecture 21 - Review of Lecture 1-19

Lecture 22 - Coherent vs Differential Detection - Part II and BER in Fading

Lecture 23 - BER in Fading - Part II, Ricean Fading

Lecture 24 - Ricean and Nakagami Fading, Moment Generating Function (MGF)

Lecture 25 - MGF Part II, WSSUS Model

Lecture 26 - WSSUS Part II, Coherence Time, Doppler Spectrum

Lecture 27 - Doppler, Temporal Characteristics of Fading Channels

Lecture 28 - WSSUS-Characterization of Time Dispersive Fading Channels

Lecture 29 - WSSUS-Classification of Fading Channels

Lecture 30 - Practical Channel Models (ITU, COST), Computer generation of Rayleigh fading

Lecture 31 - Rayleigh Fading simulation - Clark and Gans Method, Jakes's™ Method

[Lecture 32 - Jakes's™ Method properties](#)

[Lecture 33 - Introduction to Diversity, Antenna selection diversity](#)

[Lecture 34 - Statistical Characterization of Antenna Diversity, Optimal Diversity Combining](#)

[Lecture 35 - BER in fading, Equal Gain Combining](#)

[Lecture 36 - Array Gain, Diversity Gain, Alamouti Scheme](#)

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Lecture 1 - Introduction to Distributed Systems

Lecture 2 - Basic Algorithms in Message Passing System

Lecture 3 - Leader Election in Rings

Lecture 4 - Distributed Models of Computation, Causality and Logical Time

Lecture 5 - Size of Vector Clock, Matrix Clocks, Virtual Time and Physical Clock Synchronization

Lecture 6 - Global State and Snapshot Recording Algorithms

Lecture 7 - Distributed Mutual Exclusion and Non-Token based Approaches

Lecture 8 - Quorum Based Distributed Mutual Exclusion Approaches

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Lecture 13 - Distributed Shared Memory

Lecture 14 - Distributed Minimum Spanning Tree

Lecture 15 - Termination Detection in Distributed System

Lecture 16 - Message Ordering and Group Communication

Lecture 17 - Self-Stabilization

Lecture 18 - Case Study 1 - Distributed Randomized Algorithms

Lecture 19 - Case Study 2 - Peer-to-Peer Computing and Structured Overlay Network

Lecture 20 - Case Study 3 - The Google File System (GFS)

Lecture 21 - Case Study 4 - MapReduce

Lecture 22 - Case Study 5 - HDFS

Lecture 23 - Case Study 6 - Spark

Lecture 24 - Case Study 7 - Distributed Algorithms for Sensor Networks

Lecture 25 - Case Study 8 - Authentication in Distributed Systems

Lecture 26 - Case Study 9 - Bitcoin: A Peer-to-Peer Electronic Cash System

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Lecture 2 - Answer to the puzzle

Lecture 3 - Introduction to Python - 1

Lecture 4 - Introduction to Python - 2

Lecture 5 - Introduction to Networkx - 1

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Lecture 7 - Social Networks: The Challenge

Lecture 8 - Google Page Rank

Lecture 9 - Searching in a Network

Lecture 10 - Link Prediction

Lecture 11 - The Contagions

Lecture 12 - Importance of Acquaintances

Lecture 13 - Marketing on Social Networks

Lecture 14 - Introduction to Datasets

Lecture 15 - Ingredients Network

Lecture 16 - Synonymy Network

Lecture 17 - Web Graph

Lecture 18 - Social Network Datasets

Lecture 19 - Datasets : Different Formats

Lecture 20 - Datasets : How to Download?

Lecture 21 - Datasets : Analysing Using Networkx

Lecture 22 - Datasets : Analysing Using Gephi

Lecture 23 - Introduction : Emergence of Connectedness

Lecture 24 - Advanced Material : Emergence of Connectedness

Lecture 25 - Programming Illustration : Emergence of Connectedness

Lecture 26 - Summary to Datasets

Lecture 27 - Introduction

Lecture 28 - Granovetter's Strength of weak ties

Lecture 29 - Triads, clustering coefficient and neighborhood overlap

Lecture 30 - Structure of weak ties, bridges, and local bridges

Lecture 31 - Validation of Granovetter's experiment using cell phone data

Lecture 32 - Embeddedness

Lecture 33 - Structural Holes

Lecture 34 - Social Capital

Lecture 35 - Finding Communities in a graph (Brute Force Method)

Lecture 36 - Community Detection Using Girvan Newman Algorithm

Lecture 37 - Visualising Communities using Gephi

Lecture 38 - Tie Strength, Social Media and Passive Engagement

Lecture 39 - Betweenness Measures and Graph Partitioning

Lecture 40 - Strong and Weak Relationship - Summary

Lecture 41 - Introduction to Homophily - Should you watch your company ?

Lecture 42 - Selection and Social Influence

Lecture 43 - Interplay between Selection and Social Influence

Lecture 44 - Homophily - Definition and measurement

Lecture 45 - Foci Closure and Membership Closure

Lecture 46 - Introduction to Fatman Evolutionary model

Lecture 47 - Fatman Evolutionary Model - The Base Code (Adding people)

Lecture 48 - Fatman Evolutionary Model - The Base Code (Adding Social Foci)

Lecture 49 - Fatman Evolutionary Model - Implementing Homophily

Lecture 50 - Quantifying the Effect of Triadic Closure

Lecture 51 - Fatman Evolutionary Model - Implementing Closures

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Lecture 57 - Schelling Model Implementation - 1 (Introduction)

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Lecture 59 - Schelling Model Implementation - 3 (Visualization and Getting a list of boundary and internal nodes)

Lecture 60 - Schelling Model Implementation - 4 (Getting a list of unsatisfied nodes)

Lecture 61 - Schelling Model Implementation - 5 (Shifting the unsatisfied nodes and visualizing the final graph)

Lecture 62 - Chapter - 5 Positive and Negative Relationships (Introduction)

Lecture 63 - Structural Balance

Lecture 64 - Enemy'S Enemy is a Friend

- Lecture 65 - Characterizing the Structure of Balanced Networks
- Lecture 66 - Balance Theorem
- Lecture 67 - Proof of Balance Theorem
- Lecture 68 - Introduction to positive and negative edges
- Lecture 69 - Outline of implementation
- Lecture 70 - Creating graph, displaying it and counting unstable triangles
- Lecture 71 - Moving a network from an unstable to stable state
- Lecture 72 - Forming two coalitions
- Lecture 73 - Forming two coalitions (Continued...)
- Lecture 74 - Visualizing coalitions and the evolution
- Lecture 75 - The Web Graph
- Lecture 76 - Collecting the Web Graph
- Lecture 77 - Equal Coin Distribution
- Lecture 78 - Random Coin Dropping
- Lecture 79 - Google Page Ranking Using Web Graph
- Lecture 80 - Implementing PageRank Using Points Distribution Method - 1
- Lecture 81 - Implementing PageRank Using Points Distribution Method - 2
- Lecture 82 - Implementing PageRank Using Points Distribution Method - 3
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- Lecture 84 - Implementing PageRank Using Random Walk Method - 1
- Lecture 85 - Implementing PageRank Using Random Walk Method - 2
- Lecture 86 - DegreeRank versus PageRank
- Lecture 87 - We Follow
- Lecture 88 - Why do we Follow?
- Lecture 89 - Diffusion in Networks
- Lecture 90 - Modeling Diffusion
- Lecture 91 - Modeling Diffusion (Continued...)
- Lecture 92 - Impact of Communities on Diffusion
- Lecture 93 - Cascade and Clusters
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- Lecture 95 - An Introduction to the Programming Screencast (Coding 4 major ideas)
- Lecture 96 - The Base Code
- Lecture 97 - Coding the First Big Idea - Increasing the Payoff

- Lecture 98 - Coding the Second Big Idea - Key People
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- Lecture 101 - Introduction to Hubs and Authorities (A Story)
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- Lecture 105 - PageRank Revisited - An example
- Lecture 106 - PageRank Revisited - Convergence in the Example
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- Lecture 108 - PageRank, conservation and convergence - Another example
- Lecture 109 - Matrix Multiplication (Pre-requisite 1)
- Lecture 110 - Convergence in Repeated Matrix Multiplication (Pre-requisite 1)
- Lecture 111 - Addition of Two Vectors (Pre-requisite 2)
- Lecture 112 - Convergence in Repeated Matrix Multiplication- The Details
- Lecture 113 - PageRank as a Matrix Operation
- Lecture 114 - PageRank Explained
- Lecture 115 - Introduction to Powerlaw
- Lecture 116 - Why do Normal Distributions Appear?
- Lecture 117 - Power Law emerges in WWW graphs
- Lecture 118 - Detecting the Presence of Powerlaw
- Lecture 119 - Rich Get Richer Phenomenon
- Lecture 120 - Summary So Far
- Lecture 121 - Implementing Rich-getting-richer Phenomenon (Barabasi-Albert Model) - 1
- Lecture 122 - Implementing Rich-getting-richer Phenomenon (Barabasi-Albert Model) - 2
- Lecture 123 - Implementing a Random Graph (Erdos-Renyi Model) - 1
- Lecture 124 - Implementing a Random Graph (Erdos-Renyi Model) - 2
- Lecture 125 - Forced Versus Random Removal of Nodes (Attack Survivability)
- Lecture 126 - Rich Get Richer - A Possible Reason
- Lecture 127 - Rich Get Richer - The Long Tail
- Lecture 128 - Epidemics- An Introduction
- Lecture 129 - Introduction to epidemics (Continued...)
- Lecture 130 - Simple Branching Process for Modeling Epidemics

- Lecture 131 - Simple Branching Process for Modeling Epidemics (Continued...)
- Lecture 132 - Basic Reproductive Number
- Lecture 133 - Modeling epidemics on complex networks
- Lecture 134 - SIR and SIS spreading models
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- Lecture 136 - Basic Reproductive Number Revisited for Complex Networks
- Lecture 137 - Percolation model
- Lecture 138 - Analysis of basic reproductive number in branching model (The problem statement)
- Lecture 139 - Analyzing basic reproductive number - 2
- Lecture 140 - Analyzing basic reproductive number - 3
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- Lecture 142 - Analyzing basic reproductive number - 5
- Lecture 143 - Small World Effect - An Introduction
- Lecture 144 - Milgram's Experiment
- Lecture 145 - The Reason
- Lecture 146 - The Generative Model
- Lecture 147 - Decentralized Search - I
- Lecture 148 - Decentralized Search - II
- Lecture 149 - Decentralized Search - III
- Lecture 150 - Programming illustration- Small world networks : Introduction
- Lecture 151 - Base code
- Lecture 152 - Making homophily based edges
- Lecture 153 - Adding weak ties
- Lecture 154 - Plotting change in diameter
- Lecture 155 - Programming illustration- Myopic Search : Introduction>
- Lecture 156 - Myopic Search
- Lecture 157 - Myopic Search comparison to optimal search
- Lecture 158 - Time Taken by Myopic Search
- Lecture 159 - PseudoCores : Introduction
- Lecture 160 - How to be Viral
- Lecture 161 - Who are the right key nodes?
- Lecture 162 - finding the right key nodes (the core)
- Lecture 163 - Coding K-Shell Decomposition

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Lecture 1 - Introduction to Probability - A box of chocolates

Lecture 2 - Introduction to Probability - Axiomatic Approach to Probability Theory

Lecture 3 - Introduction to Probability - Verifying Matrix Multiplication (Statement, Algorithm and Independence)

Lecture 4 - Introduction to Probability - Verifying Matrix Multiplication (Correctness and Law of Total Probability)

Lecture 5 - Introduction to Probability - How Strong is your Network?

Lecture 6 - Introduction to Probability - How to Understand the World? Play with it!

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Lecture 8 - Tutorial 2

Lecture 9 - Discrete Random Variables - Basic Definitions

Lecture 10 - Discrete Random Variables - Linearity of Expectation and Jensen's Inequality

Lecture 11 - Discrete Random Variables - Conditional Expectation I

Lecture 12 - Discrete Random Variables - Conditional Expectation II

Lecture 13 - Discrete Random Variables - Geometric Random Variables and Collecting Coupons

Lecture 14 - Discrete Random Variables - Randomized Selection

Lecture 15 - Tail Bounds I - Markov's Inequality

Lecture 16 - Tail Bounds I - The Second Moment, Variance and Chebyshev's Inequality

Lecture 17 - Tail Bounds I - Median via Sampling

Lecture 18 - Tail Bounds I - Median via Sampling - Analysis

Lecture 19 - Tail Bounds I - Moment Generating Functions and Chernoff Bounds

Lecture 20 - Tail Bounds I - Parameter Estimation

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Lecture 22 - Applications of Tail Bounds - Routing in Sparse Networks

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Lecture 24 - Applications of Tail Bounds - Random Graphs

Lecture 25 - Live Session 2

Lecture 26 - Live Session

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Lecture 2 - What is HCI? Commonalities and Differences in Interfaces

Lecture 3 - Door handle, Elevators, Contextual Inquiry, Affinity Diagrams

Lecture 4 - Lab Session Contextual Inquiry

Lecture 5 - Lab Session Affinity Diagram

Lecture 6 - Tutorial on Photoshop

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Co-ordinators : Prof. Satyadhyan Chickerur, Prof. Bharatkumar Sharma, Prof. Adesuyi Tosin, Prof. Satyajit Das

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NPTEL : NOC:Responsible and Safe AI Systems (Computer Science and Engineering)

Co-ordinators : Prof. Ponnurangam Kumaraguru, Prof. Balaraman Ravindran, Prof. Arun Rajkumar

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Lecture 30 - Machine code generation - 4 (first half of lecture), Implementing object-oriented languages 1 (second half of lecture)

Lecture 31 - Implementing object-oriented languages 2 (first half of lecture)

- [Lecture 32 - Global register allocation - 1 \(second half of lecture\)](#)
- [Lecture 33 - Global register allocation - 2](#)
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- [Lecture 35 - Introduction to Machine-Independent Optimizations - 1](#)
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- [Lecture 38 - Introduction to Machine-Independent Optimizations - 4](#)
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- [Lecture 41 - Introduction to Machine-Independent Optimizations - 7 \(first half of lecture\)](#)
- [Lecture 42 - Instruction Scheduling and Software Pipelining - 1 \(second half of lecture\)](#)
- [Lecture 43 - Instruction Scheduling and Software Pipelining - 2](#)
- [Lecture 44 - Instruction Scheduling and Software Pipelining - 3 \(first part of lecture\)](#)
- [Lecture 45 - Automatic parallelization - 1 \(second half of lecture\)](#)
- [Lecture 46 - Automatic parallelization - 2](#)

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Lecture 6 - Tutorial 1 - Part I

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Lecture 5 - Matrix Operations, Homogeneous system of equations

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