Comprehensive Career Pathways in Computer Science and Engineering

- Choose Pathway
  - Software Engineering
    - Frontend Development
      - Web Development
        - HTML5
        - CSS3
        - JavaScript (React, Angular, Vue.js)
      - Mobile App Development
        - Android (Kotlin, Java)
        - iOS (Swift)
      - Game Development
        - Unity
        - Unreal Engine
    - Backend Development
      - Server-side Developemnt
        - Node.js
        - Python (Django, Flask)
        - Java (Spring Boot)
      - Database Management
        - SQL (MySQL, PostgreSQL)
        - NoSQL (MongoDB, Cassandra)
      - API Development
        - RESTful APIs
        - GraphQL
    - Full-stack Development
      - Integration of Frontend and Backend Technologies
    - Mobile App Development
      - Android Development
        - Kotlin
        - Java
        - Android SDK
      - iOS Development
        - Swift
        - iOS SDK
    - Desktop Application Development
      - Windows Desktop Development
        - Frameworks
          - .NET Framework
          - WPF (Windows Presentation Foundation)
          - WinForms
        - Languages
          - C#
          - XAML
        - Tools
          - Visual Studio
          - Visual Studio Code
      - macOS Desktop Development
        - Frameworks
          - Cocoa
          - Cocoa Touch
        - Languages
          - Objective-C
          - Swift
        - Tools
          - Xcode
      - Linux Desktop Development
        - Frameworks
          - GTK
          - Qt
        - Languages
          - C++
          - Python
        - Tools
          - Qt Creator
          - Glade
    - Cross-Platform Development
      - Desktop Cross-Platform Development
        - Electron
          - HTML5
          - CSS3
          - JavaScript (Node.js)
        - JavaFX
          - Java
        - Xamarin.Forms
          - C#
          - XAML
        - Flutter Desktop
          - Dart
      - Mobile Cross-Platform Development
        - React Native
          - JavaScript
          - TypeScript
        - Xamarin
          - C#
          - XAML
        - Flutter
          - Dart
    - Game Development
      - 2D Game Development
        - Unity
        - C#
      - 3D Game Development
        - Unity
        - Unreal Engine
        - C++
  - Data Science and Analytics
    - Data Analyst
      - Data Cleaning
        - Python (Pandas, NumPy)
        - R
      - Exploratory Data Analysis
        - Data Visualization (Matplotlib, Seaborn)
      - Data Visualization
        - Tableau
        - Power BI
    - Data Scientist
      - Predictive Modeling
        - Scikit-learn
        - TensorFlow
        - PyTorch
      - Statistical Analysis
        - R
        - Python (SciPy, StatsModels)
      - Machine Learning Algorithms
        - Python (Scikit-learn, TensorFlow, PyTorch)
    - Machine Learning Engineer
      - Deep Learning
        - TensorFlow
        - PyTorch
        - Keras
      - Neural Networks
        - Convolutional Neural Networks (CNNs)
        - Recurrent Neural Networks (RNNs)
      - Model Deployment
        - TensorFlow Serving
        - Docker
    - Big Data Engineer
      - Distributed Computing
        - Hadoop
        - Spark
      - NoSQL Databeses
        - MongoDB
        - Cassandra
      - Data Pipelines
        - Apache Kafka
        - Apache Beam
  - Cybersecurity
    - Ethical Hacking
      - Penetration Testing
        - Kali Linux
        - Metasploit
      - Vulnerability Assessment
        - Nessus
        - OpenVAS
      - Exploit Development
        - Python
        - C
    - Security ANalyst
      - Security Incident Response
        - SIEM (Security Information and Event Management) tools
      - Security Monitoring
        - Snort
        - Suricata
      - Threat Intelligence
        - Threat Intelligence Platforms
    - Cryptographer
      - Cryptography Algorithms
        - RSA
        - AES
        - SHA
      - Cryptanalysis Techniques
        - Frequency Analysis
        - Differential Cryptanalysis
      - Cryptographic Protocols
        - SSL/TLS
        - SSH
    - Network Security Engineer
      - Firewall Configuration
        - Cisco ASA
        - pfSense
      - Intrusion Detection/Prevention Systems
        - Snort
        - Suricata
      - VPN Implementation
        - OpenVPN
        - IPsec
  - Cloud Computing
    - Cloud Architect
      - Cloud Infrastructure Design
        - AWS
        - Azure
        - Google Cloud Platform (GCP)
      - Scalability Planning
        - Kubernetes
        - Docker Swarm
      - Disaster Recovery Planning
        - AWS Disaster Recovery
        - Azure Site Recovery
    - DevOps Engineer
      - Continuous Integration/Continuous Deployment (CI/CD)
        - Jenkins
        - GitLab CI/CD
        - Travis CI
      - Infrastructure Automation
        - Terraform
        - Ansible
        - Puppet
      - Monitoring and Logging
        - Prometheus
        - ELK Stack (Elasticsearch, Logstash, Kibana)
    - Cloud Security Specialist
      - Identity and Access Management (IAM)
        - AWS IAM
        - Azure Active Directory
      - Encryption and Key Management
        - AWS Key Management Service (KMS)
        - Azure Key Vault
      - Compliance Management
        - AWS Config
        - Azure Policy
    - Cloud Developer
      - Cloud-native Application Development
        - AWS Lambda
        - Azure Functions
        - Google Cloud Functions
      - Serverless Computing
        - AWS Serverless Appliction Model (SAM)
        - Azure Functions
        - Google Cloud Functions
      - Microservices Architecture
        - Kubernetes
        - Docker
        - Istio
  - Networking
    - Network Administrator
      - Network Configuration
        - Cisco IOS
        - Juniper Junos
      - Troubleshooting
        - Wireshark
        - tcpduump
      - Network Monitoring
        - Nagios
        - Zabbix
    - Network Engineer
      - Routing and Switching
        - OSPF
        - BGP
        - VLANs
      - WAN/LAN Design
        - MPLS
        - VLANs
        - Spanning Tree Protocol (STP)
      - Network Protocols Optimization
        - TCP/IP
        - UDP
        - HTTP/HTTPS
    - System Engineer
      - Server Configurations and Maintenance
        - Linux (Ubuntu, CentOS)
        - Windows Server
      - Virtualization Technologies
        - VMware vSphere
        - Microsoft Hyper-V
      - Storage Management
        - NAS (Network Attached Storage)
        - SAN (Storage Area Network)
    - Wireless Communication Engineer
      - Wi-Fi Standards and Protocols
        - 802.11ac
        - 802.11ax (Wi-Fi 6)
        - WPA3
      - Cellular Networks
        - 3G
        - 4G LTE
        - 5G NR
      - IoT Communication Protocols
        - MQTT
        - CoAP
        - AMQP
  - Embedded Systems
    - Embedded Software Engineer
      - Embedded Programming
        - C/C++
        - Python
      - Real-time Operating Systems (RTOS)
        - FreeRTOS
        - VxWorks
      - Device Driivers Development
        - Linux Kernel Programming
    - IoT Engineer
      - Sensor Integration
        - MQTT
        - CoAP
      - IoT Protocols
        - MQTT
        - CoAP
      - Cloud Integration for IoT Solutions
        - AWS IoT
        - Azure IoT
        - Google Cloud IoT
    - Firmware Engineer
      - Low-level Firmware Developmnt
        - C/C++
      - Firmware Debugging and Testing
        - JTAG
        - GDB
      - Embedded Systems Security
        - Secure Boot
        - Firmware Encryption
    - Robotics Engineer
      - Robot Kinematics and Dynamics
        - ROS (Robot Operating System)
        - Gazebo
      - Motion Planning and Control
        - PID Control
        - Path Planning Algorithms
      - Perception Systems
        - OpenCV
        - LiDAR
  - AI and Robotics
    - AI Research Scientist
      - Machine Learning Algorithms
        - TensorFlow
        - PyTorch
        - scikit-learn
      - Deep Learning Models
        - CNNs
        - RNNs
        - GANs
      - Natural Language Processing (NLP)
        - NLTK
        - spaCy
        - Transformers
    - Robotics Engineer
      - Robot Kinematics and Dynamics
        - ROS (Robot Operating System)
        - Gazebo
      - Control Systems Design
        - PID Control
        - MPC (Model Predictive Control)
      - Sensor Fusion and Perception
        - LiDAR
        - Camera Sensors
        - IMU (Inertial Measurement Unit)
    - Natural Language Processing Engineer
      - Text Processing and Analysis
        - NLTK
        - spaCy
      - Sentiment Analysis
        - Vader
        - TextBlob
      - Language Generation
        - GPT (Generative Pre-trained Transformer) models
    - Computer Vision Engineer
      - Image Processing Techniques
        - OpenCV
        - scikit-image
      - Object Detection and Recognition
        - YOLO (You Only Look Once)
        - SSD (Single Shot MultiBox Detector)
      - Facial Recognition and Biometrics
        - OpenFace
        - dlib
  - UI/UX Design
    - UI Designer
      - User Interface Design Principles
        - Material Design
        - Human Interface Guidelines (HIG)
      - Prototyping Tools
        - Figma
        - Sketch
        - Adobe XD
      - Responsive Design
        - Bootstrap
        - Foundation
    - UX Designer
      - User Research Methods
        - User Interviews
        - Surveys
        - Usability Testing
      - Wireframing and Prototyping
        - Axure RP
        - Balsamiq
      - Usability Testing
        - UserTesting.com
        - UsabilityHub
    - Interaction Designer
      - Interaction Design Patterns
        - Nielsen Norman Group
        - Material Design Guidelines
      - Motion Design
        - Adobe After Effects
        - Principle
      - Microinteractions
        - InVision Studio
        - Proto.io
    - User Researcher
      - User Interviews and Surveys
        - Google Forms
        - Typeform
      - Persona Development
        - Adobe Illustrator
        - Lucidchart
      - Usability Testing Methodologies
        - Remote Usability Testing
        - A/B Testing
  - Database Management
    - Database Administrator (DBA)
      - Database Installation and Configuration
        - MySQL
        - PostgreSQL
        - OracleDB
      - Performance Optimization
        - Indexing
        - Query Optimization
      - Backup and Recovery Strategies
        - mysqldump
        - pg_dump
    - Database Developer
      - SQL Query Optimization
        - EXPLAIN
        - ANALYSE
      - Stored Procedures and Triggers
        - PL/SQL
        - T-SQL
      - Database Design and Normalization
        - ER Diagrams
        - Database Design Tools
    - Data Architect
      - Data Modeling and Database Design
        - ERwin
        - SQL Power Architect
      - Data Warehousing
        - Amazon Redshift
        - Google BigQuery
      - ETL (Extract, Transform, Load) Processes
        - Apache Spark
        - Talend
    - Database Security Specialist
      - Access Control and Authorization
        - Role-based Access Control (RBAC)
        - Database Encryption
      - Encryption and Data Masking
        - Transparent Data Encryption (TDE)
        - Data Masking Tools
      - Compliance Management
        - Oracle Audit Vault and Database Firewall
        - IBM Guardium
  - Software Quality Assurance
    - QA Engineer
      - Test Planning and Strategy
        - TestRail
        - Xephyr
      - Test Case Design
        - TestLink
        - Xray
      - Manual Testing Techniques
        - Exploratory Testing
        - Regression
        - Testing
    - Test Automation Engineer
      - Test Automation Frameworks
        - Selenium WebDriver
        - Appium
      - Scripting and Test Script Development
        - Python
        - Java
      - Continuous Integration/Continuous Deployment (CI/CD) Pipelines
        - Jenkins
        - Travis CI
    - Quality Analyst
      - Defect Management and Tracking
        - JIRA
        - Bugzilla
      - Root Cause Analysis
        - 5 Whys
        - Fishbone Diagram
      - Quality Metrics Reporting and Analysis
        - TestRail
        - Katalon Analytics
  - Technical Writing
    - Technical Writer
      - Technical Documentation Writing
        - Markdown
        - reStructuredText
      - API Documentation
        - Swagger
        - OpenAPI
      - User Manuals and Guides
        - Adobe FrameMaker
        - MadCap Flare
    - Documentation Specialist
      - Style Guide Development
        - Microsoft Word
        - Google Docs
      - Editing and Proofreading
        - Grammarly
        - hemingway Editor
      - Version Control for Documentation
        - Git
        - SVN
    - Content Developer
      - Blog Posts and Articles
        - WordPress
        - Medium
      - Tutorials and How-to Guides
        - Markdown
        - WordPress
      - Video Scripts and Presentations
        - Google Slides
        - Microsoft PowerPoint
  - Academia and Research
    - Professor
      - Teaching Courses in Computer Science or Engineering
        - Moodle
        - Canvas
      - Conducting Research in Specialized Areas
        - Google Scholar
        - IEEE Xplore
      - Advising Students and Mentoring
        - Office Hours
        - Email Communication
    - Research Scientist
      - Conducting Original Research
        - LaTeX
        - Jupyter Notebooks
      - Publishing Papers in Academic Journals and Conferences
        - LaTeX
        - Overleaf
      - Collaborating with Industry or Government Agencies on Research Projects
        - Slack
        - Microsoft Teams
    - Lecturer
      - Delivering Lectures and Presentations
        - Zoom
        - Microsoft PowerPoint
      - Assessing Student Learning through Exams and Assignments
        - Moodle
        - Google Forms
      - Providing Academic Support and Guidance
        - Office Hours
        - Email Communication
    - Academic Advisor
      - Counselling Students on Academic and Career Goals
        - One-on-One meetings
        - Email Communication
      - Assisting with Course Selection and Programme Planning
        - Degree Planning Tools
        - Academic Advising Systems
      - Providing Support for Personal and Academic Challenges
        - Student Support Services
        - Counseling Centers