EUPHORIA STATE

https://euphoriastate.com

DATA SCIENTIST

LIVE COURSE

Join us for an insightful journey into Data Science!

March 1, 2025

Start at 5 PM IST

Ready to level up your data skills?
Reserve your spot now!!

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EUPHORIA STATE

ABOUT US

Founder @ Euphoria State
AI/ML Innovator

X(Twitter)

Co-Founder @ Euphoria State
AI Chip Designer @ Intel

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Co-Founder @ Euphoria State
Prev. Product Head @ CloudyML

Linkedin

Euphoria state is born with a simple vision, to make quality education accessible to everyone , no matter their background and provide right guidance and support to achieve greatness.

Curriculum

Learn step-by-step with weekly live classes, practical assignments, and hands-on projects.

PYTHON

Week 1: Python Basics and Foundational Concepts

- Introduction to Python
  - Syntax, indentation, comments, understanding Python's interpreter
- Variable Naming and Datatypes
  - Naming conventions, numeric types (int, float, complex), strings, type conversion, type hints
- Basic Input/Output
  - Using input() and print(), string formatting (f-strings, .format())

Week 2: Control Flow and Collections

- Control Flow
  - Conditional statements (if-else, nested conditions), logical operators (and, or, not)
  - Loops: for and while loops, break, continue, else with loops
- Data Structures: Lists and Tuples
  - Creating lists, list indexing, slicing, list methods (append, pop, extend, sort)
  - Tuples: Immutable properties, tuple unpacking, practical use cases

PYTHON

Week 3: Advanced Data Structures and Comprehensions

- Dictionaries
  - Creating dictionaries, accessing/updating/deleting keys, dictionary methods (keys(), values(), items())
  - Nested dictionaries, practical examples (JSON-like data)
- Sets
  - Creating sets, set operations (union, intersection, difference, symmetric_difference)
- List/Dictionary Comprehensions
  - Using comprehensions to create lists and dictionaries efficiently, conditional comprehensions

Week 4: Functions and Modules

- Functions
  - Defining functions, parameters and arguments, default arguments, return statements
  - Anonymous functions (lambda), function annotations, scope (local, global, nonlocal)
- Modules and Packages
  - Importing modules (import, from ... import), using standard libraries (math, random, os)
  - Working with custom modules and __init__.py

PYTHON

Week 5: File Handling and Error Management

- File Handling
  - Reading and writing text files (open(), read(), write(), file modes r, w, a)
  - Working with CSV and JSON files (csv module, json module)
- Error and Exception Handling
  - Understanding exceptions, using try, except, finally, raising custom exceptions (raise)

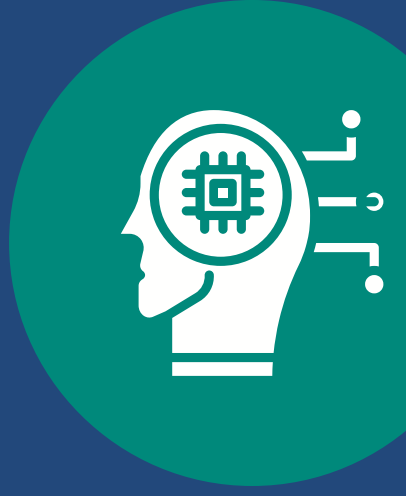
Week 6: Python for Data Analysis

- Introduction to NumPy
  - Arrays vs. lists, creating arrays, array operations, broadcasting, indexing/slicing, reshaping arrays
- Introduction to pandas
  - Series and DataFrames, creating DataFrames, basic operations (head(), describe(), info()), indexing and slicing and other methods
- Basic Data Visualization
  - Introduction to matplotlib and seaborn, creating line plots, bar charts, and scatter plots

Week 7-8: Advanced Python Concepts and Project

- Object-Oriented Programming (OOP)
  - Classes and objects, attributes and methods, inheritance, polymorphism
- Python Project
  - Exploratory Data Analysis (EDA) project using pandas, NumPy, matplotlib, and seaborn

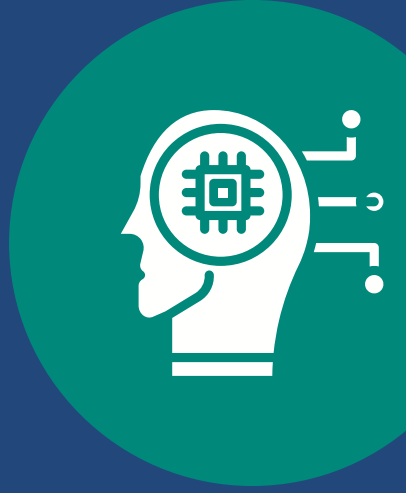
MACHINE LEARNING



Week 1: Introduction to Machine Learning and Data Preprocessing

- Introduction to Machine Learning
  - Definition and importance, types of ML (supervised, unsupervised, reinforcement learning)
  - Real-world applications: recommendation systems, fraud detection, sentiment analysis
- ML Workflow
  - Problem definition, data collection, preprocessing, modeling, evaluation, and deployment
- Data Preprocessing
  - Handling missing data (mean/mode/median imputation, forward/backward fill)
  - Encoding categorical variables (one-hot encoding, label encoding)
  - Feature scaling (min-max scaling, standardization, normalization)
- Exploratory Data Analysis (EDA)
  - Identifying outliers, correlation analysis, visualizing distributions

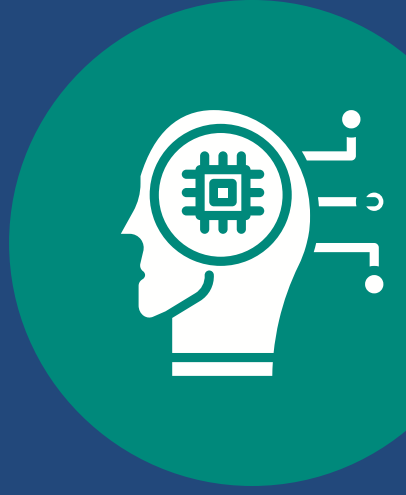
MACHINE LEARNING



Week 2: Supervised Learning - Regression

- Introduction to Regression
  - Regression vs. classification, when to use regression models
- Linear Regression
  - Mathematical intuition, assumptions, cost function (MSE), gradient descent
  - Implementation with scikit-learn (LinearRegression), interpreting coefficients
- Polynomial Regression
  - When linearity doesn’t fit, polynomial feature transformation, overfitting and underfitting
- Regularization Techniques
  - Ridge regression (L2 regularization), Lasso regression (L1 regularization)
- Model Evaluation Metrics
  - Mean Absolute Error (MAE), Mean Squared Error (MSE), R^2 score

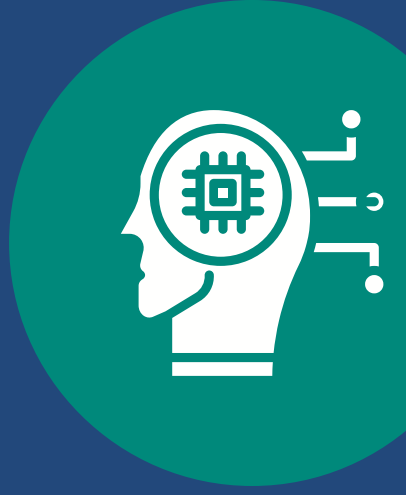
MACHINE LEARNING



Week 3: Supervised Learning - Classification

- Introduction to Classification
  - Binary vs. multi-class classification, decision boundaries
- Logistic Regression
  - Mathematical intuition, sigmoid function, decision threshold tuning
  - Practical implementation using scikit-learn
- K-Nearest Neighbors (KNN)
  - Distance metrics (Euclidean, Manhattan), choosing k, bias-variance tradeoff
- Decision Trees
  - Splitting criteria (Gini impurity, entropy), visualizing decision trees, pruning
- Random Forests
  - Bagging, Boosting, feature importance, handling overfitting with ensemble methods
- Model Evaluation Metrics for Classification
  - Confusion matrix, precision, recall, F1-score, ROC-AUC

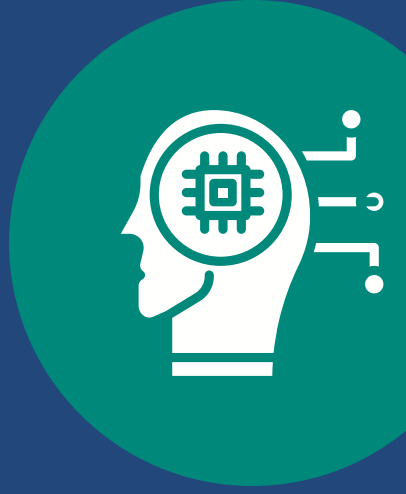
MACHINE LEARNING



Week 4: Unsupervised Learning and Advanced Topics

- Clustering Techniques
  - K-Means: Centroid initialization, elbow method for determining k
  - Hierarchical Clustering: Agglomerative clustering, dendrograms
  - DBSCAN: Density-based clustering, epsilon and min_samples
- Dimensionality Reduction
  - PCA (Principal Component Analysis): Explained variance, feature transformation
  - t-SNE (t-Distributed Stochastic Neighbor Embedding): Visualization of high-dimensional data
- Anomaly Detection
  - Techniques for outlier detection, applications in fraud detection and system monitoring

MACHINE LEARNING



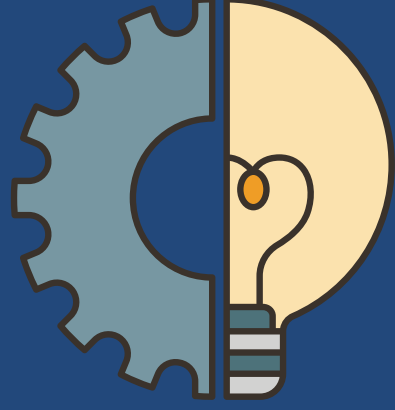
Week 5: Model Optimization and Deployment

- Model Optimization
  - Cross-validation: K-fold, leave-one-out, stratified K-fold
  - Hyperparameter Tuning: Grid search, random search, Bayesian optimization
  - Handling imbalanced datasets: SMOTE, weighted loss functions
  - Model compression
- Introduction to ML Deployment
  - Saving and loading models (joblib, pickle)
  - Basic Flask app for serving ML models
- End-to-End ML Pipeline
  - Combining preprocessing, model building, evaluation, and deployment using scikit-learn pipelines

Project:

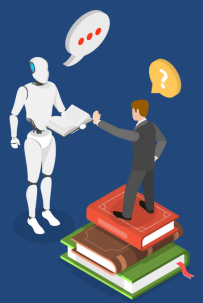
1. Regression Project: Predicting house prices using linear and polynomial regression.
2. Classification Project: Customer churn prediction using logistic regression, decision trees, and random forests.

DEEP LEARNING



Week 1: Introduction to Deep Learning and Neural Networks

- Introduction to Deep Learning
  - Why deep learning? Real-world applications (image recognition, NLP, autonomous vehicles)
  - Difference between machine learning and deep learning
  - Overview of deep learning frameworks (TensorFlow, PyTorch)
- Neural Networks Basics
  - Biological vs. artificial neurons
  - Architecture: Input, hidden, and output layers
  - Activation functions: ReLU, sigmoid, softmax, tanh
  - Cost functions: MSE, cross-entropy
- Feedforward Neural Networks
  - Forward and backward propagation, gradient descent, learning rate tuning
  - Hands-on: Building a simple neural network from scratch in TensorFlow/Keras



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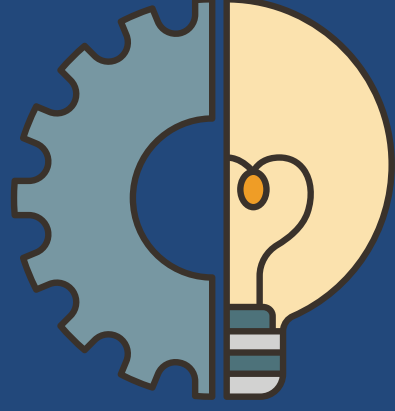
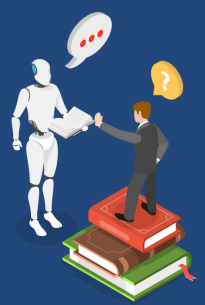


Week 2: Convolutional Neural Networks (Image-Based Project)

- Introduction to Convolutional Neural Networks (CNNs)
  - Convolution operation, filters/kernels, feature maps, auto-encoding
  - Pooling layers (max pooling, average pooling), flattening, fully connected layers
- Architectures and Use Cases
  - Famous architectures: VGG, ResNet, EfficientNet (brief overview)
  - Common use cases: Object detection, image classification
- Project (Part 1): Image Classification
  - Dataset: CIFAR-10 or Fashion-MNIST
  - Preprocessing: Resizing, normalizing, data augmentation (rotation, flipping)
  - Building a CNN model using TensorFlow/Keras
  - Training, validation, and testing the model



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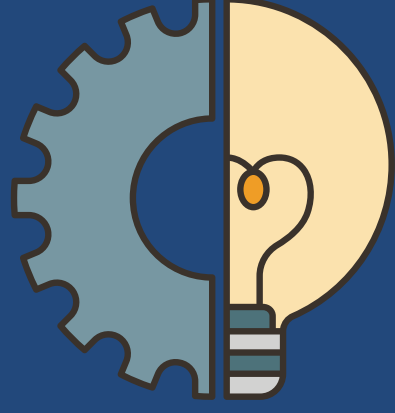
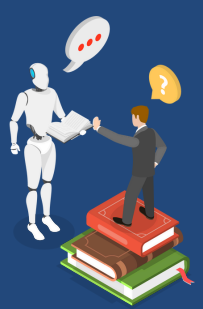


Week 3: Optimization and Transfer Learning (Image-Based Project Continuation)

- Optimization Techniques
  - Optimizers: SGD, Adam, RMSProp
  - Regularization: Dropout, L2 regularization
  - Learning rate schedules: Step decay, exponential decay
- Transfer Learning
  - Concept and benefits of transfer learning
  - Using pre-trained models (e.g., ResNet, MobileNet)
  - Fine-tuning and feature extraction
- Project (Part 2): Improving Image Classification Model
  - Apply transfer learning to improve accuracy
  - Fine-tune pre-trained model (e.g., MobileNet)
  - Evaluate and interpret the model's performance



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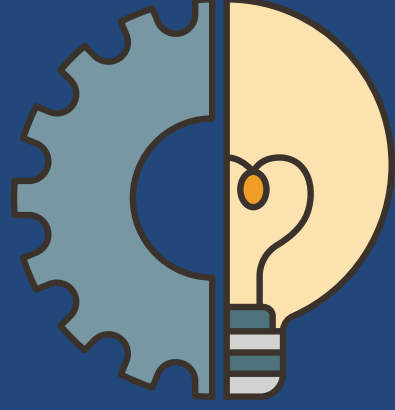
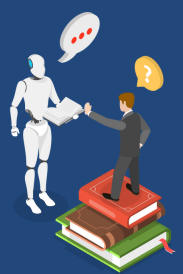


Week 4: Recurrent Neural Networks (RNNs) and Natural Language Processing (NLP-Based Project)

- Introduction to RNNs
  - Sequential data, limitations of feedforward networks
  - RNN structure, vanishing gradient problem
- Advanced RNNs: LSTMs and GRUs
  - Long Short-Term Memory (LSTM): Gates (forget, input, output), cell state
  - Gated Recurrent Units (GRUs): Simplified LSTM architecture
- Basics of Natural Language Processing
  - Tokenization, stemming, lemmatization, word embeddings (Word2Vec, GloVe)
  - Text preprocessing: Removing stopwords, handling punctuation, lowercasing
- Project (Part 1): Sentiment Analysis on Text Data
  - Dataset: IMDb or Twitter Sentiment Dataset
  - Preprocessing: Tokenization, padding sequences
  - Building an RNN/LSTM model for sentiment classification



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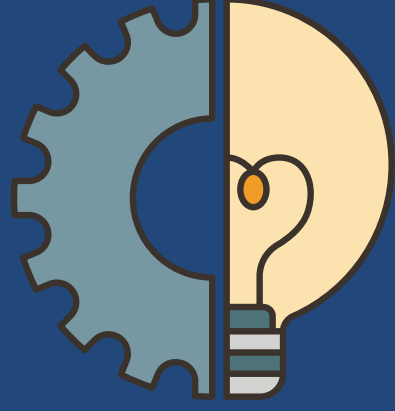
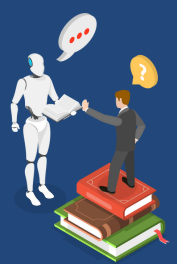


Week 5: Transformers and Advanced NLP Techniques (NLP-Based Project Continuation)

- Introduction to Transformers
  - Concept of attention, encoder-decoder architecture, multi-head attention
  - Overview of BERT, GPT, and their applications in NLP
- Fine-Tuning Pre-Trained NLP Models
  - Hugging Face library: Loading and fine-tuning BERT or GPT for text classification
  - Handling large datasets and transfer learning for NLP
- Project (Part 2): Improving NLP Sentiment Analysis
  - Fine-tune BERT/GPT on the same sentiment dataset
  - Compare performance with RNN/LSTM model
  - Model evaluation: Precision, recall, F1-score, confusion matrix

Key Deliverables

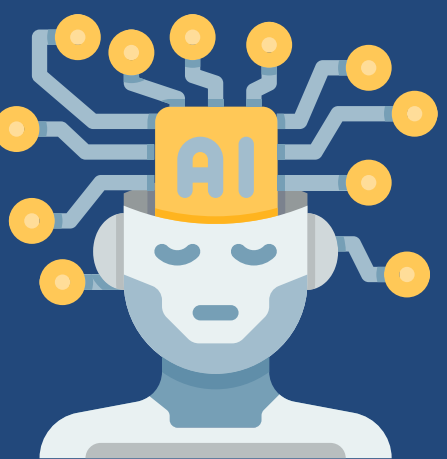
1. Project 1 (Image-Based): Image classification model with CNNs, enhanced using transfer learning.
2. Project 2 (NLP-Based): Sentiment analysis model with LSTMs, improved using a fine-tuned transformer model like BERT.



GENERATIVE AI

Week 1: Foundations of Generative AI and GANs

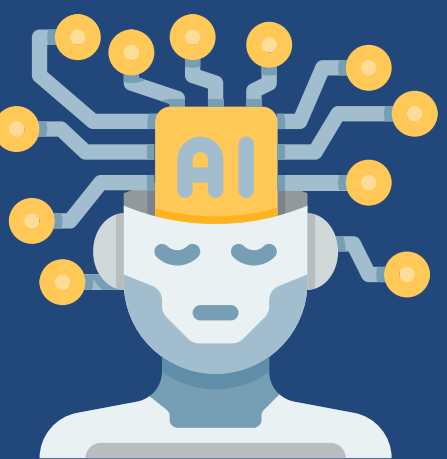
- Introduction to Generative AI
  - What is Generative AI? Applications: Image generation, text generation, deepfakes, AI art
  - Difference between discriminative and generative models
  - Generative AI in industries: Gaming, healthcare, content creation
- Introduction to Generative Adversarial Networks (GANs)
  - Architecture: Generator and discriminator
  - Adversarial training, loss functions, mode collapse
- Hands-on Project (Part 1): Building a Basic GAN
  - Dataset: MNIST (handwritten digits)
  - Preprocessing: Data normalization
  - Implementing a simple GAN using PyTorch or TensorFlow
  - Training the GAN and generating basic images



GENERATIVE AI

Week 2: Advanced GANs and Variational Autoencoders (VAEs)

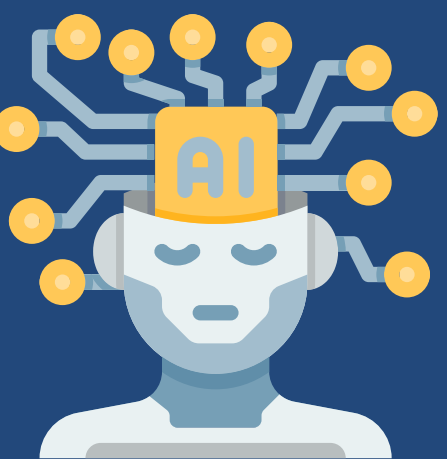
- Advanced GAN Concepts
  - Conditional GANs (cGANs): Generating specific categories (e.g., numbers, colors)
  - CycleGANs: Style transfer for unpaired image datasets (e.g., turning photos into paintings)
  - Progressive GANs and StyleGANs: High-resolution image generation
- Introduction to Variational Autoencoders (VAEs)
  - Difference between autoencoders and VAEs
  - Understanding the encoder-decoder structure and latent space
  - Applications of VAEs: Image reconstruction, anomaly detection
- Hands-on Project (Part 2): Image-to-Image Translation
  - Dataset: Edges-to-shoes or similar paired datasets
  - Implementing a CycleGAN for style transfer or image-to-image mapping



GENERATIVE AI

Week 3: Generative AI for Text and Language Models

- Generative Pre-trained Transformers (GPT)
  - Architecture: Transformers, self-attention mechanism, positional encoding
  - Overview of GPT models (GPT-2, GPT-3, GPT-4) and their capabilities
- Fine-Tuning Pre-trained Language Models
  - Using Hugging Face library for fine-tuning GPT models
  - Practical applications: Chatbots, text summarization, content generation
- Hands-on Project (Part 3): Text Generation
  - Dataset: News articles or conversational datasets
  - Fine-tuning GPT on a custom dataset for text completion or dialogue generation
  - Evaluating text quality: Perplexity, human evaluation



GENERATIVE AI

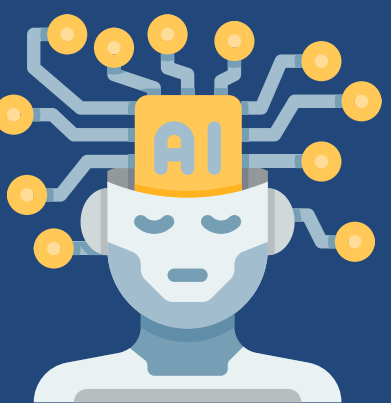
Week 4: Advanced Generative AI Techniques and Applications

- Diffusion Models
  - Understanding diffusion models (e.g., Stable Diffusion, DALL-E)
  - Applications in text-to-image generation and AI art creation
- Ethics and Challenges in Generative AI
  - Bias in generated outputs, intellectual property issues, misuse of generative models (e.g., deepfakes)
  - Best practices and tools for ethical AI development
- Hands-on Project (Part 4): Text-to-Image Generation
  - Tools: Stable Diffusion, OpenAI's DALL-E API
  - Generating images based on textual descriptions
  - Fine-tuning image generation models on custom datasets for specific styles

Key Deliverables

1. Project 1: Basic GAN for image generation (e.g., MNIST handwritten digits).
2. Project 2: CycleGAN for style transfer or image-to-image translation.
3. Project 3: Fine-tuned GPT for text generation (e.g., creating human-like dialogues or articles).

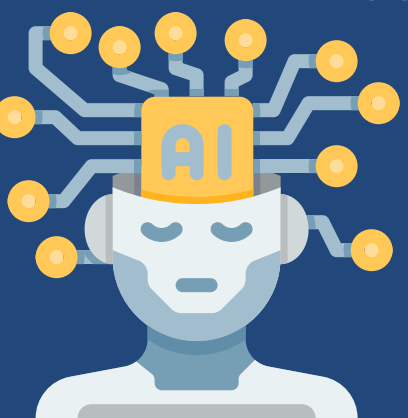
Project 4: Text-to-image generation using Stable Diffusion or DALL-E.



BUILDING AI AGENT

Week 1: Introduction to AI Agents and LangChain Basics

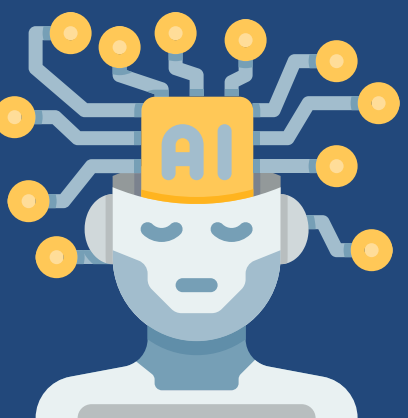
- What Are AI Agents?
  - Definition and purpose of AI agents
  - Applications in customer service, task automation, and personalized recommendations
  - Key components: Perception, decision-making, and action
- Introduction to LangChain
  - What is LangChain? Importance of modular frameworks for building LLM-powered applications
  - Core concepts:
    - Chains: Sequential and parallel workflows
    - Agents: Decision-making systems powered by LLMs
    - Tools: Integrating APIs, web scraping, and database queries
- Hands-on Project (Part 1): Task Automation with LangChain
  - Use case: Automating data retrieval and summarization from multiple online sources
  - Implementing:
    - Chain for querying APIs and processing results
    - LLM-based summarization with OpenAI models
    - Tool integration (e.g., Google Search API)



BUILDING AI AGENT

Week 2: Advanced AI Agent Concepts and CrewAI Project

- Advanced AI Agent Design
  - Memory in AI agents: Types (short-term, long-term), vector stores, and persistence with LangChain
  - Decision-making: Action planning using tools like Python functions and structured APIs
  - Error handling: Managing unexpected outputs or failures gracefully
- Introduction to CrewAI
  - Overview of CrewAI: A simplified tool for building AI agents without deep coding knowledge
  - How CrewAI complements LangChain for rapid prototyping and iterative development

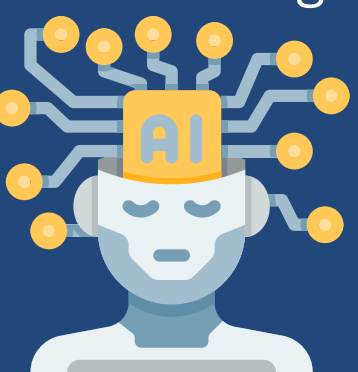


BUILDING AI AGENT

- Hands-on Project (Part 2): Task-Oriented AI Agent with CrewAI and LangChain
  - Use case: Building an AI assistant for project management tasks
  - Features to implement:
    - Querying deadlines and project updates from a spreadsheet
    - Summarizing team performance using pre-defined metrics
    - Suggesting next steps or optimizations for workflows
  - Tools and integrations:
    - Google Sheets API for task data
    - OpenAI or Hugging Face LLMs for summarization and recommendations
    - Memory modules to maintain conversation context
    -

Key Deliverables

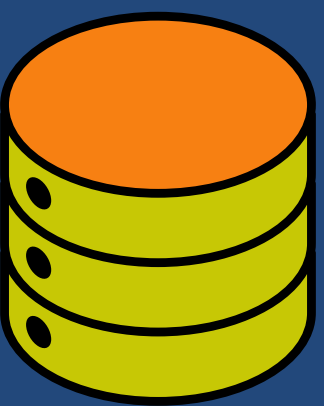
1. Project 1 (LangChain): AI task automation agent for real-world data retrieval and summarization.
2. Project 2 (CrewAI + LangChain): Task-oriented AI agent for project management, combining multiple tools and memory for enhanced decision-making.



SQL

Week 1: Introduction to SQL and Database Design

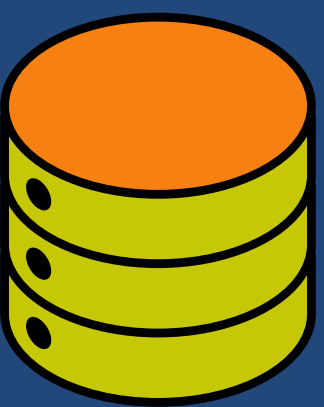
- **Understanding Databases**
  - Relational databases vs. non-relational databases
  - Database management systems (DBMS): MySQL, PostgreSQL, SQLite
  - Introduction to tables, rows, columns, and relationships
- **Basic SQL Queries**
  - SELECT statement, filtering with WHERE clause
  - Sorting results with ORDER BY
  - Aggregating data: COUNT, SUM, AVG, MAX, MIN
- **Basic Joins**
  - Inner join, left join, right join, full outer join
  - Join conditions and understanding relationships
- **Hands-on Project (Part 1): Data Extraction from a Sample Dataset**
  - Dataset: Sales data, customer data, or ecommerce data
  - Extracting relevant data using SELECT and filtering with WHERE
  - Sorting results, performing basic aggregation (e.g., total sales, customer counts)



SQL

Week 2: Advanced SQL Queries and Subqueries

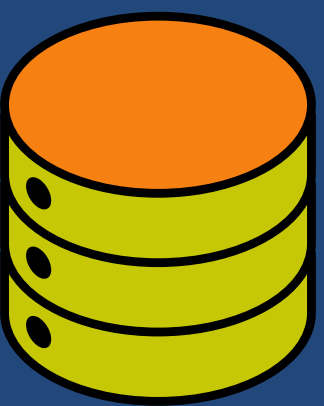
- **Advanced Joins**
  - Self-joins, cross joins
  - Combining multiple tables with complex join conditions
- **Subqueries**
  - Subqueries in SELECT, WHERE, and FROM clauses
  - Using subqueries for filtering and calculating derived metrics
- **Grouping Data**
  - GROUP BY, HAVING clause for advanced aggregation
  - Using aggregate functions in grouped data (e.g., total sales by region, average order size by product)
- **Hands-on Project (Part 2): Building Reports with Advanced Queries**
  - Dataset: Sales and customer transactions
  - Building reports with GROUP BY to analyze total sales by region, average transaction value
  - Using subqueries to identify top-performing products, customers, or regions



SQL

Week 3: Data Modification and Indexing

- **Data Insertion, Updates, and Deletions**
  - INSERT INTO statement for adding records
  - UPDATE statement for modifying data, handling data integrity
  - DELETE statement and handling referential integrity (e.g., cascading deletes)
- **Transactions and ACID Properties**
  - Understanding transactions (COMMIT, ROLLBACK)
  - Ensuring data consistency and atomicity
- **Indexes and Query Optimization**
  - Importance of indexing for fast query performance
  - Creating and using indexes
  - Query execution plans and optimizing complex queries
- **Hands-on Project (Part 3): Data Management and Optimization**
  - Dataset: Employee records and project assignments
  - Inserting, updating, and deleting records while maintaining integrity
  - Optimizing queries using indexes, improving performance on large datasets
  - Analyzing query performance using execution plans



SQL

Week 4: Complex SQL Queries, Views, and Company-Specific Problems

- **Complex Queries**
  - Window functions (e.g., ROW_NUMBER(), RANK(), LEAD(), LAG())
  - Working with dates and time intervals (DATE, TIMESTAMP, DATE_DIFF, DATE_ADD)
  - String manipulation and pattern matching (LIKE, REGEXP)
- **Views and Stored Procedures**
  - Creating and using views for reusable queries
  - Introduction to stored procedures for automating SQL logic
  - Triggers and events for automated actions based on data changes
- **Company-Specific Problem Solving**
  - Solving real-world company-specific SQL problems based on the industry (e.g., e-commerce, finance, healthcare)
    - Example: Analyzing customer churn in an e-commerce company
    - Example: Financial report generation for a company
    - Example: Analyzing employee performance and project completion in a corporate environment
- **Hands-on Project (Part 4): Company-Specific SQL Project**
  - Use case: Building complex reports and automating data retrieval for business operations
  - Working with company datasets to solve industry-specific problems using SQL queries, joins, and optimizations

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SQL

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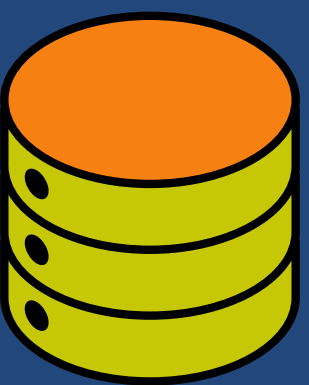
Key Deliverables

1. **Project 1**: Basic SQL report building with dataset extraction, filtering, and aggregation.
2. **Project 2**: Advanced report generation with multiple joins, subqueries, and groupings.
3. **Project 3**: Data management, transaction handling, and query optimization using indexing and execution plans.
4. **Project 4**: Solving a company-specific SQL problem (e.g., customer churn analysis, financial report generation).



CAPSTONE PROJECTS

Capstone Projects (+2 Projects)
💡 End-to-End ML Pipeline

- Data Preprocessing: Handling missing data, normalization, encoding categorical variables, and exploratory data analysis (EDA)
- Feature Engineering: Creating meaningful features, dimensionality reduction, and feature selection techniques
- Model Building: Training multiple models (e.g., regression, classification, ensemble methods) and hyperparameter tuning for optimization
- Evaluation: Assessing model performance with metrics like accuracy, precision, recall, F1-score, ROC-AUC, and confusion matrix
- Deployment: Building APIs, containerization with Docker, and integrating models into live systems

Showcase your expertise by solving real-world problems from start to finish!

ADDITIONAL PERKS

- Resume Building Guidance
- 5 Mock Interviews
- Lifetime Discord Community Access For QA
- Certificate of Completion
- 1 Month Unpaid Internship on Real World Project

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