CH17 - The Future of Business Intelligence

หลักสูตร วท.ม.เทคโนโลยีธุรกิจดิจิทัล มหาวิทยาลัยราชภัฏจันทรเกษม

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AGENDA

- Introduction to Future Trends in BI
- Emerging Technologies in BI
- Data Management and Integration
- AI/ML Workshop

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The Future of Business Intelligence

CH17 explores the emerging trends and future directions in the field of Business Intelligence (BI). It discusses technological advancements, evolving business needs, and the potential impact of new innovations on BI practices.

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Introduction to Future Trends in BI
- **Significance**: Understanding the importance of staying updated with future trends to remain competitive.
- **Current Landscape**: Overview of the current state of BI and its evolution over the years.

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Emerging Technologies in BI

Emerging Technologies in BI

- **Artificial Intelligence (AI) and Machine Learning (ML)**: The growing role of AI and ML in automating data analysis, providing predictive insights, and enhancing decision-making processes.
- **Natural Language Processing (NLP)**: Advancements in NLP for enabling conversational BI, making it easier for users to interact with BI tools using natural language queries.
- **Internet of Things (IoT)**: The integration of IoT data to provide real-time insights and improve operational efficiency.
- **Blockchain**: Exploring the potential of blockchain technology for ensuring data integrity and security in BI.

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Data Management and Integration

- **Big Data**: Handling and analyzing massive datasets to uncover hidden patterns and insights.
- **Cloud Computing**: Leveraging cloud-based BI solutions for scalability, flexibility, and cost-effectiveness.
- **Data Integration**: The importance of seamless data integration from multiple sources to create a unified view of business operations.

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AI and ML techniques in BI

- **Predictive Analytics**: Uses historical data to predict future outcomes. Techniques include regression analysis, time series forecasting, and machine learning models like decision trees and neural networks.

- **Natural Language Processing (NLP)**: Analyzes and interprets human language. It's used for sentiment analysis, chatbots, and extracting insights from unstructured data like text or social media.

- **Anomaly Detection**: Identifies unusual patterns or outliers in data. Techniques include statistical methods and machine learning algorithms like clustering and isolation forests.

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Predictive Analytics: Regression Analysis

```python
from sklearn.linear_model import LinearRegression
import pandas as pd

# Example data
data = pd.DataFrame({
    'feature': [1, 2, 3, 4, 5],
    'target': [2, 4, 5, 4, 5]
})

X = data[['feature']]
y = data['target']

model = LinearRegression()
model.fit(X, y)

# Predict future values
predictions = model.predict([[6]])
print(predictions)
```

Natural Language Processing (NLP): Sentiment Analysis

```python
from textblob import TextBlob

text = "I love this product!"
blob = TextBlob(text)
sentiment = blob.sentiment.polarity
print(f'Sentiment score: {sentiment}')
```

Anomaly Detection: Isolation Forest

```python
from sklearn.ensemble import IsolationForest
import numpy as np

# Example data
X = np.array([[1], [2], [3], [4], [5], [100]])

model = IsolationForest(contamination=0.1)
model.fit(X)
predictions = model.predict(X)
print(predictions)
```

AI and ML techniques in BI

- **Recommendation Systems**: Provides personalized recommendations based on user behavior and preferences. Techniques include collaborative filtering, content-based filtering, and hybrid approaches.
- **Classification**: Categorizes data into predefined classes. Common methods include logistic regression, support vector machines, and deep learning.
- **Clustering**: Groups similar data points together without predefined labels. Techniques include k-means, hierarchical clustering, and DBSCAN.

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Recommendation Systems: Collaborative Filtering with Surprise

```python
from surprise import Dataset, Reader, SVD, accuracy
from surprise.model_selection import train_test_split

# Load dataset
data = Dataset.load_builtin('ml-100k')
reader = Reader(line_format='user item rating timestamp', sep='\t')
data = Dataset.load_from_df(data.build_full_trainset().all_ratings(), reader)

trainset, testset = train_test_split(data, test_size=0.25)

model = SVD()
model.fit(trainset)
predictions = model.test(testset)

# Calculate accuracy
accuracy.rmse(predictions)
```

Classification: Logistic Regression

```python
from sklearn.datasets import load_iris
from sklearn.model_selection import train_test_split
from sklearn.linear_model import LogisticRegression
from sklearn.metrics import accuracy_score

# Load dataset
data = load_iris()
X = data.data
y = data.target

X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.3, random_state=42)

model = LogisticRegression(max_iter=200)
model.fit(X_train, y_train)
predictions = model.predict(X_test)
accuracy = accuracy_score(y_test, predictions)
print(f'Accuracy: {accuracy}')
```

Clustering: K-Means Clustering

```python
from sklearn.cluster import KMeans
import numpy as np

# Example data
X = np.array([[1, 2], [1, 4], [1, 0],
          [4, 2], [4, 4], [4, 0]])

model = KMeans(n_clusters=2)
model.fit(X)
labels = model.predict(X)
print(labels)
```

AI and ML techniques in BI

- **Data Visualization**: Uses AI to enhance the creation and interpretation of visual representations of data. Tools can automatically generate insights and visualizations based on data patterns.
- **Automated Reporting**: AI can automate the generation of reports and dashboards, providing real-time insights and reducing manual effort.
- **Optimizing Queries**: Machine learning can optimize database queries and data retrieval processes, improving performance and efficiency.

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Data Visualization: Using Seaborn

```python
import seaborn as sns
import matplotlib.pyplot as plt
import pandas as pd

# Example data
data = pd.DataFrame({
    'x': [1, 2, 3, 4, 5],
    'y': [2, 3, 5, 7, 11]
})

sns.scatterplot(x='x', y='y', data=data)
plt.show()
```

Automated Reporting: Generating Reports with Pandas Profiling

```python
import pandas as pd
from pandas_profiling import ProfileReport

# Example data
data = pd.DataFrame({
    'x': [1, 2, 3, 4, 5],
    'y': [2, 3, 5, 7, 11]
})

profile = ProfileReport(data, title="Pandas Profiling Report")
profile.to_file("report.html")
```

Optimizing Queries: Using Indexes with SQLite

```python
import sqlite3

# Connect to database
conn = sqlite3.connect('example.db')
cursor = conn.cursor()

# Create table and index
cursor.execute('CREATE TABLE IF NOT EXISTS data (id INTEGER PRIMARY KEY, value INTEGER)')
cursor.execute('CREATE INDEX IF NOT EXISTS idx_value ON data (value)')

# Insert data
cursor.executemany('INSERT INTO data (value) VALUES (?)', [(i,) for i in range(1000)])

# Query data
cursor.execute('SELECT * FROM data WHERE value = ?', (500,))
rows = cursor.fetchall()
print(rows)

conn.close()
```

AI-ML Workshop

https://www.kaggle.com