(venv) vikash SEO_Formulas_implementation % python SEO.py ✅ Dataset loaded ✅ successfully.

📊 Using dataset for MDP (10000 samples)

63/63 ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 0s 563us/step

MDP: MSE = 0.0017

📊 Using dataset for Q-Learning (10000 samples)

63/63 ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 0s 558us/step

Q-Learning: MSE = 0.0000

📊 Using dataset for Bellman Optimality (10000 samples)

63/63 ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 0s 564us/step

Bellman Optimality: MSE = 0.0021

📊 Using dataset for Temporal DiTerence (10000 samples)

63/63 ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 0s 561us/step

Temporal DiTerence: MSE = 0.0000

📊 Using dataset for Policy Gradient (10000 samples)

63/63 ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 0s 557us/step

Policy Gradient: MSE = 0.5630

📊 Using dataset for CTR (10000 samples)

63/63 ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 0s 555us/step

CTR: MSE = 172634.6719

📊 Using dataset for PageRank (10000 samples)

63/63 ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 0s 560us/step

PageRank: MSE = 0.0000

📊 Using dataset for DCG (10000 samples)

63/63 ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 0s 562us/step

DCG: MSE = 0.0001

📊 Using dataset for NDCG (10000 samples)

63/63 ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 0s 562us/step

NDCG: MSE = 0.0046

📊 Using dataset for Cosine Similarity (10000 samples)

63/63 ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 0s 563us/step

Cosine Similarity: MSE = 0.0013

📊 Using dataset for TF-IDF (10000 samples)

63/63 ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 0s 564us/step

TF-IDF: MSE = 0.0120

📊 Using dataset for RankBrain (10000 samples)

63/63 ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 0s 561us/step

RankBrain: MSE = 0.0000

📊 Using dataset for Softmax Keyword Selection (10000 samples)

63/63 ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 0s 578us/step

Softmax Keyword Selection: MSE = 0.0000

📊 Using dataset for Multi-Armed Bandit (10000 samples)

63/63 ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 0s 567us/step

Multi-Armed Bandit: MSE = 0.0011

📊 Using dataset for Deep Q-Learning (10000 samples)

63/63 ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 0s 569us/step

Deep Q-Learning: MSE = 0.0012

📊 Using dataset for Logistic Regression (10000 samples)

63/63 ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 0s 576us/step

Logistic Regression: MSE = 0.0000

📊 Using dataset for F-Score (10000 samples)

63/63 ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 0s 571us/step

F-Score: MSE = 0.0000

📊 Using dataset for Keyword Probability (10000 samples)

63/63 ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 0s 566us/step

Keyword Probability: MSE = 0.0000

📊 Using dataset for Reinforcement Learning Loss (10000 samples)

63/63 ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 0s 567us/step

Reinforcement Learning Loss: MSE = 1.5038

📊 Using dataset for Hybrid Model 1 (10000 samples)

63/63 ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 0s 562us/step

Hybrid Model 1: MSE = 2846.2964

📊 Using dataset for Hybrid Model 2 (10000 samples)

63/63 ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 0s 566us/step

Hybrid Model 2: MSE = 2954.0667

📊 Using dataset for Hybrid Model 3 (10000 samples)

63/63 ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 0s 572us/step

Hybrid Model 3: MSE = 3031.2805

📊 Using dataset for Hybrid Model 4 (10000 samples)

63/63 ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 0s 589us/step

Hybrid Model 4: MSE = 2824.2410

📊 Using dataset for Hybrid Model 5 (10000 samples)

63/63 ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 0s 567us/step

Hybrid Model 5: MSE = 2800.6892

📊 Using dataset for Hybrid Model 6 (10000 samples)

63/63 ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 0s 565us/step

Hybrid Model 6: MSE = 2687.7271

📊 Using dataset for Hybrid Model 7 (10000 samples)

63/63 ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 0s 566us/step

Hybrid Model 7: MSE = 2977.8093

📊 Using dataset for Hybrid Model 8 (10000 samples)

63/63 ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 0s 574us/step

Hybrid Model 8: MSE = 2814.7319

📊 Using dataset for Hybrid Model 9 (10000 samples)

63/63 ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 0s 560us/step

Hybrid Model 9: MSE = 3096.5161

📊 Using dataset for Hybrid Model 10 (10000 samples)

63/63 ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 0s 557us/step

Hybrid Model 10: MSE = 2841.2117

🏆 Best Formula: Softmax Keyword Selection with MSE = 0.0000

(venv) vikash SEO_Formulas_implementation %