Created ci-config.yaml

Configuration loaded from ci-config.yaml

STARTING DATA AUGMENTATION PIPELINE

==================================================

Created batch structure: batchy-streamy/batch\_1

Found data at: balanced\_dataset.csv

Loaded data: (272, 12)

Columns: ['created\_at', 'title', 'industry', 'year', 'source\_url', 'company', 'application\_tags', 'tools\_tags', 'extra\_tags', 'techniques\_tags', 'short\_summary', 'full\_summary']

Detected - Text column: 'full\_summary', Label column: 'industry'

Cleaned data shape: (272, 12)

Step 1: Text augmentation ...

Starting augmentation for 16 classes...

Augmenting class 'Finance': 17 → 100 samples

Augmenting class 'Insurance': 17 → 100 samples

Augmenting class 'Media & Entertainment': 17 → 100 samples

Augmenting class 'Legal': 17 → 100 samples

Augmenting class 'Government': 17 → 100 samples

Augmenting class 'Automotive': 17 → 100 samples

Augmenting class 'Telecommunications': 17 → 100 samples

Augmenting class 'E-commerce': 17 → 100 samples

Augmenting class 'Education': 17 → 100 samples

Augmenting class 'Energy': 17 → 100 samples

Augmenting class 'Consulting': 17 → 100 samples

Augmenting class 'HR': 17 → 100 samples

Augmenting class 'Research & Academia': 17 → 100 samples

Augmenting class 'Healthcare': 17 → 100 samples

Augmenting class 'Tech': 17 → 100 samples

Augmenting class 'Other': 17 → 100 samples

Augmented 76 new samples

Step 2: Class balancing ...

Balancing 16 classes to 24 samples each...

Balanced 'Education': 23 → 24 samples

Balanced 'Healthcare': 22 → 24 samples

Balanced 'E-commerce': 22 → 24 samples

Balanced 'Telecommunications': 22 → 24 samples

Balanced 'Other': 22 → 24 samples

Balanced 'Insurance': 21 → 24 samples

Balanced 'Consulting': 21 → 24 samples

Balanced 'Government': 21 → 24 samples

Balanced 'Automotive': 21 → 24 samples

Balanced 'HR': 21 → 24 samples

Balanced 'Tech': 21 → 24 samples

Balanced 'Finance': 20 → 24 samples

Balanced 'Legal': 19 → 24 samples

Balanced data from 348 to 384 samples

Dataset enhanced: 272 → 384 samples

Enhanced dataset saved to: batchy-streamy/batch\_1/data/enhanced\_dataset.csv

Training data samples: 307

Test data samples: 77

Batch 1 preparation complete!

AUGMENTATION PIPELINE COMPLETED!

Batch Location: batchy-streamy/batch\_1

Batch Number: 1

Original Samples: 384

Training Samples: 307

Test Samples: 77

STARTING CONTINUOUS IMPROVEMENT PIPELINE

Target Drift Threshold: 0.03

Maximum Iterations: 5

================================================================================

ITERATION 1/5

================================================================================

ITERATION 1 - CONTINUOUS IMPROVEMENT CYCLE

================================================================================

STEP 1: DATA AUGMENTATION

Configuration loaded from ci-config.yaml

STARTING DATA AUGMENTATION PIPELINE

==================================================

Created batch structure: batchy-streamy/batch\_2

Found data at: balanced\_dataset.csv

Loaded data: (272, 12)

Columns: ['created\_at', 'title', 'industry', 'year', 'source\_url', 'company', 'application\_tags', 'tools\_tags', 'extra\_tags', 'techniques\_tags', 'short\_summary', 'full\_summary']

Detected - Text: 'full\_summary', Label: 'industry'

Cleaned data shape: (272, 12)

Step 1: Text augmentation...

Starting augmentation for 16 classes...

Augmenting class 'Finance': 17 -> 100 samples

Augmenting class 'Insurance': 17 -> 100 samples

Augmenting class 'Media & Entertainment': 17 -> 100 samples

Augmenting class 'Legal': 17 -> 100 samples

Augmenting class 'Government': 17 -> 100 samples

Augmenting class 'Automotive': 17 -> 100 samples

Augmenting class 'Telecommunications': 17 -> 100 samples

Augmenting class 'E-commerce': 17 -> 100 samples

Augmenting class 'Education': 17 -> 100 samples

Augmenting class 'Energy': 17 -> 100 samples

Augmenting class 'Consulting': 17 -> 100 samples

Augmenting class 'HR': 17 -> 100 samples

Augmenting class 'Research & Academia': 17 -> 100 samples

Augmenting class 'Healthcare': 17 -> 100 samples

Augmenting class 'Tech': 17 -> 100 samples

Augmenting class 'Other': 17 -> 100 samples

Augmented 71 new samples

Step 2: Class balancing...

Balancing 16 classes to 28 samples each...

Balanced 'Automotive': 25 -> 28 samples

Balanced 'Tech': 23 -> 28 samples

Balanced 'HR': 23 -> 28 samples

Balanced 'Finance': 22 -> 28 samples

Balanced 'Legal': 22 -> 28 samples

Balanced 'E-commerce': 21 -> 28 samples

Balanced 'Insurance': 21 -> 28 samples

Balanced 'Research & Academia': 21 -> 28 samples

Balanced 'Energy': 21 -> 28 samples

Balanced 'Government': 20 -> 28 samples

Balanced 'Media & Entertainment': 20 -> 28 samples

Balanced 'Healthcare': 20 -> 28 samples

Balanced 'Other': 20 -> 28 samples

Balanced 'Consulting': 19 -> 28 samples

Balanced 'Education': 17 -> 28 samples

Balanced data from 343 to 448 samples

Dataset enhanced: 272 -> 448 samples

Enhanced dataset saved to: batchy-streamy/batch\_2/data/enhanced\_dataset.csv

Training data: 358 samples

Test data: 90 samples

Batch 2 preparation complete!

STEP 2: DRIFT-RESISTANT TRAINING

Configuration loaded successfully from ci-config.yaml

STARTING DRIFT-RESISTANT TRAINING PIPELINE

==================================================

Loaded enhanced training data: (358, 12)

Auto-detected columns - Text: 'full\_summary', Label: 'industry'

Using text column: 'full\_summary'

Using label column: 'industry'

Created drift-resistant features: (358, 800)

Feature shape: (358, 800)

Number of classes: 16

Initialized 5 drift-resistant models:

logistic\_regression

random\_forest

decision\_tree

neural\_network

svm

Creating 8 stable chunks from 358 samples...

Class distribution: {np.int64(0): np.int64(23), np.int64(1): np.int64(23), np.int64(2): np.int64(22), np.int64(3): np.int64(22), np.int64(4): np.int64(22), np.int64(5): np.int64(23), np.int64(6): np.int64(22), np.int64(7): np.int64(22), np.int64(8): np.int64(22), np.int64(9): np.int64(22), np.int64(10): np.int64(22), np.int64(11): np.int64(23), np.int64(12): np.int64(22), np.int64(13): np.int64(23), np.int64(14): np.int64(23), np.int64(15): np.int64(22)}

Chunk 1: 44 samples, 16 classes

Chunk 2: 44 samples, 15 classes

Chunk 3: 44 samples, 14 classes

Chunk 4: 44 samples, 16 classes

Chunk 5: 44 samples, 16 classes

Chunk 6: 44 samples, 16 classes

Chunk 7: 44 samples, 16 classes

Chunk 8: 50 samples, 15 classes

============================================================

TRAINING DRIFT-RESISTANT MODELS ON CHUNK 1

============================================================

Warning: Chunk 1 has class with only 1 sample. Using regular split.

--- Training LOGISTIC\_REGRESSION on chunk 1 ---

Val Accuracy: 0.2222, Val F1: 0.1481

Stability: 0.4744

New best chunk for logistic\_regression: 1 (Adj. Score: 0.1956)

--- Training RANDOM\_FOREST on chunk 1 ---

Val Accuracy: 0.0000, Val F1: 0.0000

Stability: 0.4783

New best chunk for random\_forest: 1 (Adj. Score: 0.0478)

--- Training DECISION\_TREE on chunk 1 ---

Val Accuracy: 0.0000, Val F1: 0.0000

Stability: 0.6393

New best chunk for decision\_tree: 1 (Adj. Score: 0.0639)

--- Training NEURAL\_NETWORK on chunk 1 ---

Val Accuracy: 0.1111, Val F1: 0.0222

Stability: 0.9867

New best chunk for neural\_network: 1 (Adj. Score: 0.1209)

--- Training SVM on chunk 1 ---

Val Accuracy: 0.2222, Val F1: 0.1481

Stability: 0.7884

New best chunk for svm: 1 (Adj. Score: 0.2270)

============================================================

TRAINING DRIFT-RESISTANT MODELS ON CHUNK 2

============================================================

Warning: Chunk 2 has class with only 1 sample. Using regular split.

--- Training LOGISTIC\_REGRESSION on chunk 2 ---

Val Accuracy: 0.4444, Val F1: 0.4074

Stability: 0.6568

New best chunk for logistic\_regression: 2 (Adj. Score: 0.4731)

--- Training RANDOM\_FOREST on chunk 2 ---

Val Accuracy: 0.2222, Val F1: 0.2037

Stability: 0.5166

New best chunk for random\_forest: 2 (Adj. Score: 0.2554)

--- Training DECISION\_TREE on chunk 2 ---

Val Accuracy: 0.3333, Val F1: 0.2778

Stability: 0.7044

New best chunk for decision\_tree: 2 (Adj. Score: 0.3482)

--- Training NEURAL\_NETWORK on chunk 2 ---

Val Accuracy: 0.1111, Val F1: 0.0222

Stability: 0.9923

New best chunk for neural\_network: 2 (Adj. Score: 0.1215)

--- Training SVM on chunk 2 ---

Val Accuracy: 0.2222, Val F1: 0.1481

Stability: 0.7977

New best chunk for svm: 2 (Adj. Score: 0.2279)

============================================================

TRAINING DRIFT-RESISTANT MODELS ON CHUNK 3

============================================================

Warning: Chunk 3 has class with only 1 sample. Using regular split.

--- Training LOGISTIC\_REGRESSION on chunk 3 ---

Val Accuracy: 0.7778, Val F1: 0.8148

Stability: 0.8697

New best chunk for logistic\_regression: 3 (Adj. Score: 0.9018)

--- Training RANDOM\_FOREST on chunk 3 ---

Val Accuracy: 0.2222, Val F1: 0.2222

Stability: 0.5906

New best chunk for random\_forest: 3 (Adj. Score: 0.2813)

--- Training DECISION\_TREE on chunk 3 ---

Val Accuracy: 0.1111, Val F1: 0.0370

Stability: 0.5039

--- Training NEURAL\_NETWORK on chunk 3 ---

Val Accuracy: 0.0000, Val F1: 0.0000

Stability: 0.8868

--- Training SVM on chunk 3 ---

Val Accuracy: 0.5556, Val F1: 0.5333

Stability: 0.8059

New best chunk for svm: 3 (Adj. Score: 0.6139)

============================================================

TRAINING DRIFT-RESISTANT MODELS ON CHUNK 4

============================================================

Warning: Chunk 4 has class with only 1 sample. Using regular split.

--- Training LOGISTIC\_REGRESSION on chunk 4 ---

Val Accuracy: 0.4444, Val F1: 0.4000

Stability: 0.6441

--- Training RANDOM\_FOREST on chunk 4 ---

Val Accuracy: 0.4444, Val F1: 0.3778

Stability: 0.6485

New best chunk for random\_forest: 4 (Adj. Score: 0.4426)

--- Training DECISION\_TREE on chunk 4 ---

Val Accuracy: 0.2222, Val F1: 0.1389

Stability: 0.6928

--- Training NEURAL\_NETWORK on chunk 4 ---

Val Accuracy: 0.0000, Val F1: 0.0000

Stability: 0.9939

--- Training SVM on chunk 4 ---

Val Accuracy: 0.4444, Val F1: 0.3333

Stability: 0.7478

============================================================

TRAINING DRIFT-RESISTANT MODELS ON CHUNK 5

============================================================

Warning: Chunk 5 has class with only 1 sample. Using regular split.

--- Training LOGISTIC\_REGRESSION on chunk 5 ---

Val Accuracy: 0.3333, Val F1: 0.2407

Stability: 0.5633

--- Training RANDOM\_FOREST on chunk 5 ---

Val Accuracy: 0.2222, Val F1: 0.2222

Stability: 0.5561

--- Training DECISION\_TREE on chunk 5 ---

Val Accuracy: 0.1111, Val F1: 0.1111

Stability: 0.6956

--- Training NEURAL\_NETWORK on chunk 5 ---

Val Accuracy: 0.0000, Val F1: 0.0000

Stability: 0.9927

--- Training SVM on chunk 5 ---

Val Accuracy: 0.1111, Val F1: 0.1111

Stability: 0.7121

============================================================

TRAINING DRIFT-RESISTANT MODELS ON CHUNK 6

============================================================

Warning: Chunk 6 has class with only 1 sample. Using regular split.

--- Training LOGISTIC\_REGRESSION on chunk 6 ---

Val Accuracy: 0.4444, Val F1: 0.4074

Stability: 0.6924

--- Training RANDOM\_FOREST on chunk 6 ---

Val Accuracy: 0.3333, Val F1: 0.2852

Stability: 0.5978

--- Training DECISION\_TREE on chunk 6 ---

Val Accuracy: 0.0000, Val F1: 0.0000

Stability: 0.7449

--- Training NEURAL\_NETWORK on chunk 6 ---

Val Accuracy: 0.1111, Val F1: 0.0222

Stability: 0.9890

--- Training SVM on chunk 6 ---

Val Accuracy: 0.0000, Val F1: 0.0000

Stability: 0.6696

============================================================

TRAINING DRIFT-RESISTANT MODELS ON CHUNK 7

============================================================

Warning: Chunk 7 has class with only 1 sample. Using regular split.

--- Training LOGISTIC\_REGRESSION on chunk 7 ---

Val Accuracy: 0.4444, Val F1: 0.3333

Stability: 0.6384

--- Training RANDOM\_FOREST on chunk 7 ---

Val Accuracy: 0.2222, Val F1: 0.1481

Stability: 0.5530

--- Training DECISION\_TREE on chunk 7 ---

Val Accuracy: 0.0000, Val F1: 0.0000

Stability: 0.7562

--- Training NEURAL\_NETWORK on chunk 7 ---

Val Accuracy: 0.1111, Val F1: 0.0222

Stability: 0.9891

--- Training SVM on chunk 7 ---

Val Accuracy: 0.2222, Val F1: 0.2037

Stability: 0.6550

============================================================

TRAINING DRIFT-RESISTANT MODELS ON CHUNK 8

============================================================

Warning: Chunk 8 has class with only 1 sample. Using regular split.

--- Training LOGISTIC\_REGRESSION on chunk 8 ---

Val Accuracy: 0.3000, Val F1: 0.2800

Stability: 0.6127

--- Training RANDOM\_FOREST on chunk 8 ---

Val Accuracy: 0.2000, Val F1: 0.2333

Stability: 0.5972

--- Training DECISION\_TREE on chunk 8 ---

Val Accuracy: 0.5000, Val F1: 0.4600

Stability: 0.8973

New best chunk for decision\_tree: 8 (Adj. Score: 0.5497)

--- Training NEURAL\_NETWORK on chunk 8 ---

Val Accuracy: 0.0000, Val F1: 0.0000

Stability: 0.9936

--- Training SVM on chunk 8 ---

Val Accuracy: 0.3000, Val F1: 0.3333

Stability: 0.9236

Saved 40 chunk models

==================================================

FINDING BEST CHUNK MODELS

==================================================

logistic\_regression | Best chunk: 3 | f1\_score: 0.8148

random\_forest | Best chunk: 4 | f1\_score: 0.3778

decision\_tree | Best chunk: 8 | f1\_score: 0.4600

neural\_network | Best chunk: 2 | f1\_score: 0.0222

svm | Best chunk: 3 | f1\_score: 0.5333

==================================================

CREATING DRIFT-RESISTANT ENSEMBLE MODEL

==================================================

logistic\_regression | Weight: 0.8422 | F1: 0.8148 | Stability: 0.8697

random\_forest | Weight: 0.5131 | F1: 0.3778 | Stability: 0.6485

decision\_tree | Weight: 0.6787 | F1: 0.4600 | Stability: 0.8973

neural\_network | Weight: 0.5073 | F1: 0.0222 | Stability: 0.9923

svm | Weight: 0.6696 | F1: 0.5333 | Stability: 0.8059

Created ensemble with 5 models

Ensemble model saved to: batchy-streamy/batch\_2/best\_models/ensemble\_model.pkl

DRIFT-RESISTANT TRAINING COMPLETED!

Models saved in: batchy-streamy/batch\_2/models

Chunks processed: 8

Models trained: 5

STEP 3: DRIFT ANALYSIS

Simulating drift analysis...

ITERATION EVALUATION:

Data Drift: 0.0533

Concept Drift: 0.0546

Combined Drift: 0.0788

Target Threshold: 0.0300

NEW BEST! (Previous best: 0.0788)

CONTINUING IMPROVEMENT...

Completed 1/5 iterations

ITERATION 2/5

================================================================================

ITERATION 2 - CONTINUOUS IMPROVEMENT CYCLE

================================================================================

STEP 1: DATA AUGMENTATION

Configuration loaded from ci-config.yaml

STARTING DATA AUGMENTATION PIPELINE

==================================================

Created batch structure: batchy-streamy/batch\_3

Found data at: balanced\_dataset.csv

Loaded data: (272, 12)

Columns: ['created\_at', 'title', 'industry', 'year', 'source\_url', 'company', 'application\_tags', 'tools\_tags', 'extra\_tags', 'techniques\_tags', 'short\_summary', 'full\_summary']

Detected - Text: 'full\_summary', Label: 'industry'

Cleaned data shape: (272, 12)

Step 1: Text augmentation...

Starting augmentation for 16 classes...

Augmenting class 'Finance': 17 -> 100 samples

Augmenting class 'Insurance': 17 -> 100 samples

Augmenting class 'Media & Entertainment': 17 -> 100 samples

Augmenting class 'Legal': 17 -> 100 samples

Augmenting class 'Government': 17 -> 100 samples

Augmenting class 'Automotive': 17 -> 100 samples

Augmenting class 'Telecommunications': 17 -> 100 samples

Augmenting class 'E-commerce': 17 -> 100 samples

Augmenting class 'Education': 17 -> 100 samples

Augmenting class 'Energy': 17 -> 100 samples

Augmenting class 'Consulting': 17 -> 100 samples

Augmenting class 'HR': 17 -> 100 samples

Augmenting class 'Research & Academia': 17 -> 100 samples

Augmenting class 'Healthcare': 17 -> 100 samples

Augmenting class 'Tech': 17 -> 100 samples

Augmenting class 'Other': 17 -> 100 samples

Augmented 83 new samples

Step 2: Class balancing...

Balancing 16 classes to 25 samples each...

Balanced 'E-commerce': 24 -> 25 samples

Balanced 'Education': 24 -> 25 samples

Balanced 'Automotive': 24 -> 25 samples

Balanced 'Energy': 24 -> 25 samples

Balanced 'Research & Academia': 23 -> 25 samples

Balanced 'Finance': 23 -> 25 samples

Balanced 'Media & Entertainment': 22 -> 25 samples

Balanced 'Healthcare': 22 -> 25 samples

Balanced 'Tech': 22 -> 25 samples

Balanced 'Insurance': 21 -> 25 samples

Balanced 'Legal': 21 -> 25 samples

Balanced 'Consulting': 21 -> 25 samples

Balanced 'Government': 21 -> 25 samples

Balanced 'Telecommunications': 20 -> 25 samples

Balanced 'HR': 18 -> 25 samples

Balanced data from 355 to 400 samples

Dataset enhanced: 272 -> 400 samples

Enhanced dataset saved to: batchy-streamy/batch\_3/data/enhanced\_dataset.csv

Training data: 320 samples

Test data: 80 samples

Batch 3 preparation complete!

STEP 2: DRIFT-RESISTANT TRAINING

Configuration loaded successfully from ci-config.yaml

STARTING DRIFT-RESISTANT TRAINING PIPELINE

==================================================

Loaded enhanced training data: (320, 12)

Auto-detected columns - Text: 'full\_summary', Label: 'industry'

Using text column: 'full\_summary'

Using label column: 'industry'

Created drift-resistant features: (320, 800)

Feature shape: (320, 800)

Number of classes: 16

Initialized 5 drift-resistant models:

logistic\_regression

random\_forest

decision\_tree

neural\_network

svm

Creating 8 stable chunks from 320 samples...

Class distribution: {np.int64(0): np.int64(20), np.int64(1): np.int64(20), np.int64(2): np.int64(20), np.int64(3): np.int64(20), np.int64(4): np.int64(20), np.int64(5): np.int64(20), np.int64(6): np.int64(20), np.int64(7): np.int64(20), np.int64(8): np.int64(20), np.int64(9): np.int64(20), np.int64(10): np.int64(20), np.int64(11): np.int64(20), np.int64(12): np.int64(20), np.int64(13): np.int64(20), np.int64(14): np.int64(20), np.int64(15): np.int64(20)}

Chunk 1: 40 samples, 15 classes

Chunk 2: 40 samples, 14 classes

Chunk 3: 40 samples, 16 classes

Chunk 4: 40 samples, 14 classes

Chunk 5: 40 samples, 14 classes

Chunk 6: 40 samples, 14 classes

Chunk 7: 40 samples, 15 classes

Chunk 8: 40 samples, 15 classes

============================================================

TRAINING DRIFT-RESISTANT MODELS ON CHUNK 1

============================================================

Warning: Chunk 1 has class with only 1 sample. Using regular split.

--- Training LOGISTIC\_REGRESSION on chunk 1 ---

Val Accuracy: 0.2500, Val F1: 0.1875

Stability: 0.5705

New best chunk for logistic\_regression: 1 (Adj. Score: 0.2445)

--- Training RANDOM\_FOREST on chunk 1 ---

Val Accuracy: 0.0000, Val F1: 0.0000

Stability: 0.4572

New best chunk for random\_forest: 1 (Adj. Score: 0.0457)

--- Training DECISION\_TREE on chunk 1 ---

Val Accuracy: 0.1250, Val F1: 0.1250

Stability: 0.6844

New best chunk for decision\_tree: 1 (Adj. Score: 0.1934)

--- Training NEURAL\_NETWORK on chunk 1 ---

Val Accuracy: 0.0000, Val F1: 0.0000

Stability: 0.9928

New best chunk for neural\_network: 1 (Adj. Score: 0.0993)

--- Training SVM on chunk 1 ---

Val Accuracy: 0.1250, Val F1: 0.1250

Stability: 0.7269

New best chunk for svm: 1 (Adj. Score: 0.1977)

============================================================

TRAINING DRIFT-RESISTANT MODELS ON CHUNK 2

============================================================

Warning: Chunk 2 has class with only 1 sample. Using regular split.

--- Training LOGISTIC\_REGRESSION on chunk 2 ---

Val Accuracy: 0.1250, Val F1: 0.1250

Stability: 0.5388

--- Training RANDOM\_FOREST on chunk 2 ---

Val Accuracy: 0.1250, Val F1: 0.1250

Stability: 0.5343

New best chunk for random\_forest: 2 (Adj. Score: 0.1784)

--- Training DECISION\_TREE on chunk 2 ---

Val Accuracy: 0.1250, Val F1: 0.0500

Stability: 0.5323

--- Training NEURAL\_NETWORK on chunk 2 ---

Val Accuracy: 0.0000, Val F1: 0.0000

Stability: 0.9156

--- Training SVM on chunk 2 ---

Val Accuracy: 0.1250, Val F1: 0.0500

Stability: 0.5645

============================================================

TRAINING DRIFT-RESISTANT MODELS ON CHUNK 3

============================================================

Warning: Chunk 3 has class with only 1 sample. Using regular split.

--- Training LOGISTIC\_REGRESSION on chunk 3 ---

Val Accuracy: 0.1250, Val F1: 0.1250

Stability: 0.5264

--- Training RANDOM\_FOREST on chunk 3 ---

Val Accuracy: 0.1250, Val F1: 0.1250

Stability: 0.5305

--- Training DECISION\_TREE on chunk 3 ---

Val Accuracy: 0.1250, Val F1: 0.0833

Stability: 0.7544

--- Training NEURAL\_NETWORK on chunk 3 ---

Val Accuracy: 0.1250, Val F1: 0.0278

Stability: 0.9957

New best chunk for neural\_network: 3 (Adj. Score: 0.1273)

--- Training SVM on chunk 3 ---

Val Accuracy: 0.1250, Val F1: 0.1250

Stability: 0.4984

============================================================

TRAINING DRIFT-RESISTANT MODELS ON CHUNK 4

============================================================

Warning: Chunk 4 has class with only 1 sample. Using regular split.

--- Training LOGISTIC\_REGRESSION on chunk 4 ---

Val Accuracy: 0.5000, Val F1: 0.4375

Stability: 0.6224

New best chunk for logistic\_regression: 4 (Adj. Score: 0.4997)

--- Training RANDOM\_FOREST on chunk 4 ---

Val Accuracy: 0.2500, Val F1: 0.2917

Stability: 0.5546

New best chunk for random\_forest: 4 (Adj. Score: 0.3471)

--- Training DECISION\_TREE on chunk 4 ---

Val Accuracy: 0.3750, Val F1: 0.4167

Stability: 0.8311

New best chunk for decision\_tree: 4 (Adj. Score: 0.4998)

--- Training NEURAL\_NETWORK on chunk 4 ---

Val Accuracy: 0.1250, Val F1: 0.0278

Stability: 0.9178

--- Training SVM on chunk 4 ---

Val Accuracy: 0.2500, Val F1: 0.2083

Stability: 0.5062

New best chunk for svm: 4 (Adj. Score: 0.2589)

============================================================

TRAINING DRIFT-RESISTANT MODELS ON CHUNK 5

============================================================

Warning: Chunk 5 has class with only 1 sample. Using regular split.

--- Training LOGISTIC\_REGRESSION on chunk 5 ---

Val Accuracy: 0.3750, Val F1: 0.4167

Stability: 0.7051

--- Training RANDOM\_FOREST on chunk 5 ---

Val Accuracy: 0.1250, Val F1: 0.1250

Stability: 0.5248

--- Training DECISION\_TREE on chunk 5 ---

Val Accuracy: 0.1250, Val F1: 0.0417

Stability: 0.7281

--- Training NEURAL\_NETWORK on chunk 5 ---

Val Accuracy: 0.1250, Val F1: 0.0417

Stability: 0.9670

New best chunk for neural\_network: 5 (Adj. Score: 0.1384)

--- Training SVM on chunk 5 ---

Val Accuracy: 0.0000, Val F1: 0.0000

Stability: 0.7905

============================================================

TRAINING DRIFT-RESISTANT MODELS ON CHUNK 6

============================================================

Warning: Chunk 6 has class with only 1 sample. Using regular split.

--- Training LOGISTIC\_REGRESSION on chunk 6 ---

Val Accuracy: 0.1250, Val F1: 0.0500

Stability: 0.4518

--- Training RANDOM\_FOREST on chunk 6 ---

Val Accuracy: 0.1250, Val F1: 0.0500

Stability: 0.5074

--- Training DECISION\_TREE on chunk 6 ---

Val Accuracy: 0.0000, Val F1: 0.0000

Stability: 0.7263

--- Training NEURAL\_NETWORK on chunk 6 ---

Val Accuracy: 0.0000, Val F1: 0.0000

Stability: 0.9884

--- Training SVM on chunk 6 ---

Val Accuracy: 0.1250, Val F1: 0.0417

Stability: 0.4871

============================================================

TRAINING DRIFT-RESISTANT MODELS ON CHUNK 7

============================================================

Warning: Chunk 7 has class with only 1 sample. Using regular split.

--- Training LOGISTIC\_REGRESSION on chunk 7 ---

Val Accuracy: 0.2500, Val F1: 0.2083

Stability: 0.5887

--- Training RANDOM\_FOREST on chunk 7 ---

Val Accuracy: 0.2500, Val F1: 0.2083

Stability: 0.5701

--- Training DECISION\_TREE on chunk 7 ---

Val Accuracy: 0.2500, Val F1: 0.2500

Stability: 0.8524

--- Training NEURAL\_NETWORK on chunk 7 ---

Val Accuracy: 0.0000, Val F1: 0.0000

Stability: 0.9956

--- Training SVM on chunk 7 ---

Val Accuracy: 0.3750, Val F1: 0.2361

Stability: 0.8960

New best chunk for svm: 7 (Adj. Score: 0.3257)

============================================================

TRAINING DRIFT-RESISTANT MODELS ON CHUNK 8

============================================================

Warning: Chunk 8 has class with only 1 sample. Using regular split.

--- Training LOGISTIC\_REGRESSION on chunk 8 ---

Val Accuracy: 0.3750, Val F1: 0.3333

Stability: 0.6500

--- Training RANDOM\_FOREST on chunk 8 ---

Val Accuracy: 0.1250, Val F1: 0.1250

Stability: 0.5491

--- Training DECISION\_TREE on chunk 8 ---

Val Accuracy: 0.1250, Val F1: 0.0625

Stability: 0.7386

--- Training NEURAL\_NETWORK on chunk 8 ---

Val Accuracy: 0.0000, Val F1: 0.0000

Stability: 0.9789

--- Training SVM on chunk 8 ---

Val Accuracy: 0.2500, Val F1: 0.2500

Stability: 0.8966

New best chunk for svm: 8 (Adj. Score: 0.3397)

Saved 40 chunk models

==================================================

FINDING BEST CHUNK MODELS

==================================================

logistic\_regression | Best chunk: 4 | f1\_score: 0.4375

random\_forest | Best chunk: 4 | f1\_score: 0.2917

decision\_tree | Best chunk: 4 | f1\_score: 0.4167

neural\_network | Best chunk: 5 | f1\_score: 0.0417

svm | Best chunk: 8 | f1\_score: 0.2500

==================================================

CREATING DRIFT-RESISTANT ENSEMBLE MODEL

==================================================

logistic\_regression | Weight: 0.5300 | F1: 0.4375 | Stability: 0.6224

random\_forest | Weight: 0.4232 | F1: 0.2917 | Stability: 0.5546

decision\_tree | Weight: 0.6239 | F1: 0.4167 | Stability: 0.8311

neural\_network | Weight: 0.5043 | F1: 0.0417 | Stability: 0.9670

svm | Weight: 0.5733 | F1: 0.2500 | Stability: 0.8966

Created ensemble with 5 models

Ensemble model saved to: batchy-streamy/batch\_3/best\_models/ensemble\_model.pkl

DRIFT-RESISTANT TRAINING COMPLETED!

Models saved in: batchy-streamy/batch\_3/models

Chunks processed: 8

Models trained: 5

STEP 3: DRIFT ANALYSIS

Simulating drift analysis...

ITERATION EVALUATION:

Data Drift: 0.0705

Concept Drift: 0.0318

Combined Drift: 0.0633

Target Threshold: 0.0300

NEW BEST! (Previous best: 0.0633)

CONTINUING IMPROVEMENT...

Completed 2/5 iterations

ITERATION 3/5

================================================================================

ITERATION 3 - CONTINUOUS IMPROVEMENT CYCLE

================================================================================

STEP 1: DATA AUGMENTATION

Configuration loaded from ci-config.yaml

STARTING DATA AUGMENTATION PIPELINE

==================================================

Created batch structure: batchy-streamy/batch\_4

Found data at: balanced\_dataset.csv

Loaded data: (272, 12)

Columns: ['created\_at', 'title', 'industry', 'year', 'source\_url', 'company', 'application\_tags', 'tools\_tags', 'extra\_tags', 'techniques\_tags', 'short\_summary', 'full\_summary']

Detected - Text: 'full\_summary', Label: 'industry'

Cleaned data shape: (272, 12)

Step 1: Text augmentation...

Starting augmentation for 16 classes...

Augmenting class 'Finance': 17 -> 100 samples

Augmenting class 'Insurance': 17 -> 100 samples

Augmenting class 'Media & Entertainment': 17 -> 100 samples

Augmenting class 'Legal': 17 -> 100 samples

Augmenting class 'Government': 17 -> 100 samples

Augmenting class 'Automotive': 17 -> 100 samples

Augmenting class 'Telecommunications': 17 -> 100 samples

Augmenting class 'E-commerce': 17 -> 100 samples

Augmenting class 'Education': 17 -> 100 samples

Augmenting class 'Energy': 17 -> 100 samples

Augmenting class 'Consulting': 17 -> 100 samples

Augmenting class 'HR': 17 -> 100 samples

Augmenting class 'Research & Academia': 17 -> 100 samples

Augmenting class 'Healthcare': 17 -> 100 samples

Augmenting class 'Tech': 17 -> 100 samples

Augmenting class 'Other': 17 -> 100 samples

Augmented 73 new samples

Step 2: Class balancing...

Balancing 16 classes to 26 samples each...

Balanced 'Government': 25 -> 26 samples

Balanced 'E-commerce': 23 -> 26 samples

Balanced 'Insurance': 23 -> 26 samples

Balanced 'Education': 23 -> 26 samples

Balanced 'HR': 23 -> 26 samples

Balanced 'Legal': 22 -> 26 samples

Balanced 'Media & Entertainment': 21 -> 26 samples

Balanced 'Finance': 21 -> 26 samples

Balanced 'Consulting': 21 -> 26 samples

Balanced 'Healthcare': 20 -> 26 samples

Balanced 'Telecommunications': 20 -> 26 samples

Balanced 'Tech': 20 -> 26 samples

Balanced 'Research & Academia': 20 -> 26 samples

Balanced 'Automotive': 19 -> 26 samples

Balanced 'Energy': 18 -> 26 samples

Balanced data from 345 to 416 samples

Dataset enhanced: 272 -> 416 samples

Enhanced dataset saved to: batchy-streamy/batch\_4/data/enhanced\_dataset.csv

Training data: 332 samples

Test data: 84 samples

Batch 4 preparation complete!

STEP 2: DRIFT-RESISTANT TRAINING

Configuration loaded successfully from ci-config.yaml

STARTING DRIFT-RESISTANT TRAINING PIPELINE

==================================================

Loaded enhanced training data: (332, 12)

Auto-detected columns - Text: 'full\_summary', Label: 'industry'

Using text column: 'full\_summary'

Using label column: 'industry'

Created drift-resistant features: (332, 800)

Feature shape: (332, 800)

Number of classes: 16

Initialized 5 drift-resistant models:

logistic\_regression

random\_forest

decision\_tree

neural\_network

svm

Creating 8 stable chunks from 332 samples...

Class distribution: {np.int64(0): np.int64(21), np.int64(1): np.int64(21), np.int64(2): np.int64(21), np.int64(3): np.int64(20), np.int64(4): np.int64(21), np.int64(5): np.int64(21), np.int64(6): np.int64(20), np.int64(7): np.int64(21), np.int64(8): np.int64(21), np.int64(9): np.int64(21), np.int64(10): np.int64(20), np.int64(11): np.int64(21), np.int64(12): np.int64(20), np.int64(13): np.int64(21), np.int64(14): np.int64(21), np.int64(15): np.int64(21)}

Chunk 1: 41 samples, 16 classes

Chunk 2: 41 samples, 15 classes

Chunk 3: 41 samples, 16 classes

Chunk 4: 41 samples, 14 classes

Chunk 5: 41 samples, 15 classes

Chunk 6: 41 samples, 15 classes

Chunk 7: 41 samples, 14 classes

Chunk 8: 45 samples, 13 classes

============================================================

TRAINING DRIFT-RESISTANT MODELS ON CHUNK 1

============================================================

Warning: Chunk 1 has class with only 1 sample. Using regular split.

--- Training LOGISTIC\_REGRESSION on chunk 1 ---

Val Accuracy: 0.5556, Val F1: 0.6000

Stability: 0.7505

New best chunk for logistic\_regression: 1 (Adj. Score: 0.6750)

--- Training RANDOM\_FOREST on chunk 1 ---

Val Accuracy: 0.2222, Val F1: 0.2222

Stability: 0.5448

New best chunk for random\_forest: 1 (Adj. Score: 0.2767)

--- Training DECISION\_TREE on chunk 1 ---

Val Accuracy: 0.1111, Val F1: 0.1111

Stability: 0.7228

New best chunk for decision\_tree: 1 (Adj. Score: 0.1834)

--- Training NEURAL\_NETWORK on chunk 1 ---

Val Accuracy: 0.1111, Val F1: 0.0222

Stability: 0.9794

New best chunk for neural\_network: 1 (Adj. Score: 0.1202)

--- Training SVM on chunk 1 ---

Val Accuracy: 0.1111, Val F1: 0.1111

Stability: 0.8917

New best chunk for svm: 1 (Adj. Score: 0.2003)

============================================================

TRAINING DRIFT-RESISTANT MODELS ON CHUNK 2

============================================================

Warning: Chunk 2 has class with only 1 sample. Using regular split.

--- Training LOGISTIC\_REGRESSION on chunk 2 ---

Val Accuracy: 0.3333, Val F1: 0.2963

Stability: 0.5970

--- Training RANDOM\_FOREST on chunk 2 ---

Val Accuracy: 0.3333, Val F1: 0.2889

Stability: 0.6392

New best chunk for random\_forest: 2 (Adj. Score: 0.3528)

--- Training DECISION\_TREE on chunk 2 ---

Val Accuracy: 0.2222, Val F1: 0.2593

Stability: 0.6668

New best chunk for decision\_tree: 2 (Adj. Score: 0.3259)

--- Training NEURAL\_NETWORK on chunk 2 ---

Val Accuracy: 0.0000, Val F1: 0.0000

Stability: 0.9872

--- Training SVM on chunk 2 ---

Val Accuracy: 0.3333, Val F1: 0.3704

Stability: 0.7478

New best chunk for svm: 2 (Adj. Score: 0.4451)

============================================================

TRAINING DRIFT-RESISTANT MODELS ON CHUNK 3

============================================================

Warning: Chunk 3 has class with only 1 sample. Using regular split.

--- Training LOGISTIC\_REGRESSION on chunk 3 ---

Val Accuracy: 0.2222, Val F1: 0.2593

Stability: 0.6111

--- Training RANDOM\_FOREST on chunk 3 ---

Val Accuracy: 0.1111, Val F1: 0.1481

Stability: 0.5427

--- Training DECISION\_TREE on chunk 3 ---

Val Accuracy: 0.0000, Val F1: 0.0000

Stability: 0.5802

--- Training NEURAL\_NETWORK on chunk 3 ---

Val Accuracy: 0.0000, Val F1: 0.0000

Stability: 0.9928

--- Training SVM on chunk 3 ---

Val Accuracy: 0.2222, Val F1: 0.2037

Stability: 0.8927

============================================================

TRAINING DRIFT-RESISTANT MODELS ON CHUNK 4

============================================================

Warning: Chunk 4 has class with only 1 sample. Using regular split.

--- Training LOGISTIC\_REGRESSION on chunk 4 ---

Val Accuracy: 0.3333, Val F1: 0.3148

Stability: 0.6463

--- Training RANDOM\_FOREST on chunk 4 ---

Val Accuracy: 0.0000, Val F1: 0.0000

Stability: 0.4471

--- Training DECISION\_TREE on chunk 4 ---

Val Accuracy: 0.2222, Val F1: 0.2222

Stability: 0.7187

--- Training NEURAL\_NETWORK on chunk 4 ---

Val Accuracy: 0.0000, Val F1: 0.0000

Stability: 0.9983

--- Training SVM on chunk 4 ---

Val Accuracy: 0.2222, Val F1: 0.1556

Stability: 0.5341

============================================================

TRAINING DRIFT-RESISTANT MODELS ON CHUNK 5

============================================================

Warning: Chunk 5 has class with only 1 sample. Using regular split.

--- Training LOGISTIC\_REGRESSION on chunk 5 ---

Val Accuracy: 0.2222, Val F1: 0.2222

Stability: 0.5699

--- Training RANDOM\_FOREST on chunk 5 ---

Val Accuracy: 0.3333, Val F1: 0.2407

Stability: 0.5784

--- Training DECISION\_TREE on chunk 5 ---

Val Accuracy: 0.2222, Val F1: 0.2222

Stability: 0.7474

--- Training NEURAL\_NETWORK on chunk 5 ---

Val Accuracy: 0.0000, Val F1: 0.0000

Stability: 0.9884

--- Training SVM on chunk 5 ---

Val Accuracy: 0.2222, Val F1: 0.1556

Stability: 0.6968

============================================================

TRAINING DRIFT-RESISTANT MODELS ON CHUNK 6

============================================================

Warning: Chunk 6 has class with only 1 sample. Using regular split.

--- Training LOGISTIC\_REGRESSION on chunk 6 ---

Val Accuracy: 0.3333, Val F1: 0.3333

Stability: 0.6413

--- Training RANDOM\_FOREST on chunk 6 ---

Val Accuracy: 0.1111, Val F1: 0.1111

Stability: 0.5396

--- Training DECISION\_TREE on chunk 6 ---

Val Accuracy: 0.1111, Val F1: 0.0741

Stability: 0.5922

--- Training NEURAL\_NETWORK on chunk 6 ---

Val Accuracy: 0.1111, Val F1: 0.0222

Stability: 0.9929

New best chunk for neural\_network: 6 (Adj. Score: 0.1215)

--- Training SVM on chunk 6 ---

Val Accuracy: 0.1111, Val F1: 0.1111

Stability: 0.5403

============================================================

TRAINING DRIFT-RESISTANT MODELS ON CHUNK 7

============================================================

Warning: Chunk 7 has class with only 1 sample. Using regular split.

--- Training LOGISTIC\_REGRESSION on chunk 7 ---

Val Accuracy: 0.2222, Val F1: 0.1852

Stability: 0.4578

--- Training RANDOM\_FOREST on chunk 7 ---

Val Accuracy: 0.1111, Val F1: 0.1111

Stability: 0.4344

--- Training DECISION\_TREE on chunk 7 ---

Val Accuracy: 0.1111, Val F1: 0.0444

Stability: 0.7071

--- Training NEURAL\_NETWORK on chunk 7 ---

Val Accuracy: 0.0000, Val F1: 0.0000

Stability: 0.9767

--- Training SVM on chunk 7 ---

Val Accuracy: 0.0000, Val F1: 0.0000

Stability: 0.5315

============================================================

TRAINING DRIFT-RESISTANT MODELS ON CHUNK 8

============================================================

Warning: Chunk 8 has class with only 1 sample. Using regular split.

--- Training LOGISTIC\_REGRESSION on chunk 8 ---

Val Accuracy: 0.3333, Val F1: 0.3333

Stability: 0.6207

--- Training RANDOM\_FOREST on chunk 8 ---

Val Accuracy: 0.2222, Val F1: 0.2593

Stability: 0.5623

--- Training DECISION\_TREE on chunk 8 ---

Val Accuracy: 0.3333, Val F1: 0.3333

Stability: 0.7906

New best chunk for decision\_tree: 8 (Adj. Score: 0.4124)

--- Training NEURAL\_NETWORK on chunk 8 ---

Val Accuracy: 0.1111, Val F1: 0.0222

Stability: 0.9836

--- Training SVM on chunk 8 ---

Val Accuracy: 0.4444, Val F1: 0.3444

Stability: 0.8874

Saved 40 chunk models

==================================================

FINDING BEST CHUNK MODELS

==================================================

logistic\_regression | Best chunk: 1 | f1\_score: 0.6000

random\_forest | Best chunk: 2 | f1\_score: 0.2889

decision\_tree | Best chunk: 8 | f1\_score: 0.3333

neural\_network | Best chunk: 6 | f1\_score: 0.0222

svm | Best chunk: 2 | f1\_score: 0.3704

==================================================

CREATING DRIFT-RESISTANT ENSEMBLE MODEL

==================================================

logistic\_regression | Weight: 0.6752 | F1: 0.6000 | Stability: 0.7505

random\_forest | Weight: 0.4640 | F1: 0.2889 | Stability: 0.6392

decision\_tree | Weight: 0.5619 | F1: 0.3333 | Stability: 0.7906

neural\_network | Weight: 0.5076 | F1: 0.0222 | Stability: 0.9929

svm | Weight: 0.5591 | F1: 0.3704 | Stability: 0.7478

Created ensemble with 5 models

Ensemble model saved to: batchy-streamy/batch\_4/best\_models/ensemble\_model.pkl

DRIFT-RESISTANT TRAINING COMPLETED!

Models saved in: batchy-streamy/batch\_4/models

Chunks processed: 8

Models trained: 5

STEP 3: DRIFT ANALYSIS

Simulating drift analysis...

ITERATION EVALUATION:

Data Drift: 0.0857

Concept Drift: 0.0567

Combined Drift: 0.0679

Target Threshold: 0.0300

CONTINUING IMPROVEMENT...

Completed 3/5 iterations

ITERATION 4/5

================================================================================

ITERATION 4 - CONTINUOUS IMPROVEMENT CYCLE

================================================================================

STEP 1: DATA AUGMENTATION

Configuration loaded from ci-config.yaml

STARTING DATA AUGMENTATION PIPELINE

==================================================

Created batch structure: batchy-streamy/batch\_5

Found data at: balanced\_dataset.csv

Loaded data: (272, 12)

Columns: ['created\_at', 'title', 'industry', 'year', 'source\_url', 'company', 'application\_tags', 'tools\_tags', 'extra\_tags', 'techniques\_tags', 'short\_summary', 'full\_summary']

Detected - Text: 'full\_summary', Label: 'industry'

Cleaned data shape: (272, 12)

Step 1: Text augmentation...

Starting augmentation for 16 classes...

Augmenting class 'Finance': 17 -> 100 samples

Augmenting class 'Insurance': 17 -> 100 samples

Augmenting class 'Media & Entertainment': 17 -> 100 samples

Augmenting class 'Legal': 17 -> 100 samples

Augmenting class 'Government': 17 -> 100 samples

Augmenting class 'Automotive': 17 -> 100 samples

Augmenting class 'Telecommunications': 17 -> 100 samples

Augmenting class 'E-commerce': 17 -> 100 samples

Augmenting class 'Education': 17 -> 100 samples

Augmenting class 'Energy': 17 -> 100 samples

Augmenting class 'Consulting': 17 -> 100 samples

Augmenting class 'HR': 17 -> 100 samples

Augmenting class 'Research & Academia': 17 -> 100 samples

Augmenting class 'Healthcare': 17 -> 100 samples

Augmenting class 'Tech': 17 -> 100 samples

Augmenting class 'Other': 17 -> 100 samples

Augmented 71 new samples

Step 2: Class balancing...

Balancing 16 classes to 26 samples each...

Balanced 'Finance': 24 -> 26 samples

Balanced 'Education': 23 -> 26 samples

Balanced 'Government': 23 -> 26 samples

Balanced 'Other': 23 -> 26 samples

Balanced 'Legal': 22 -> 26 samples

Balanced 'E-commerce': 21 -> 26 samples

Balanced 'Insurance': 21 -> 26 samples

Balanced 'Tech': 21 -> 26 samples

Balanced 'Research & Academia': 21 -> 26 samples

Balanced 'Automotive': 21 -> 26 samples

Balanced 'Consulting': 21 -> 26 samples

Balanced 'Energy': 20 -> 26 samples

Balanced 'Media & Entertainment': 19 -> 26 samples

Balanced 'Telecommunications': 19 -> 26 samples

Balanced 'Healthcare': 18 -> 26 samples

Balanced data from 343 to 416 samples

Dataset enhanced: 272 -> 416 samples

Enhanced dataset saved to: batchy-streamy/batch\_5/data/enhanced\_dataset.csv

Training data: 332 samples

Test data: 84 samples

Batch 5 preparation complete!

STEP 2: DRIFT-RESISTANT TRAINING

Configuration loaded successfully from ci-config.yaml

STARTING DRIFT-RESISTANT TRAINING PIPELINE

==================================================

Loaded enhanced training data: (332, 12)

Auto-detected columns - Text: 'full\_summary', Label: 'industry'

Using text column: 'full\_summary'

Using label column: 'industry'

Created drift-resistant features: (332, 800)

Feature shape: (332, 800)

Number of classes: 16

Initialized 5 drift-resistant models:

logistic\_regression

random\_forest

decision\_tree

neural\_network

svm

Creating 8 stable chunks from 332 samples...

Class distribution: {np.int64(0): np.int64(21), np.int64(1): np.int64(21), np.int64(2): np.int64(21), np.int64(3): np.int64(20), np.int64(4): np.int64(21), np.int64(5): np.int64(21), np.int64(6): np.int64(20), np.int64(7): np.int64(21), np.int64(8): np.int64(21), np.int64(9): np.int64(21), np.int64(10): np.int64(20), np.int64(11): np.int64(21), np.int64(12): np.int64(20), np.int64(13): np.int64(21), np.int64(14): np.int64(21), np.int64(15): np.int64(21)}

Chunk 1: 41 samples, 16 classes

Chunk 2: 41 samples, 15 classes

Chunk 3: 41 samples, 16 classes

Chunk 4: 41 samples, 14 classes

Chunk 5: 41 samples, 15 classes

Chunk 6: 41 samples, 15 classes

Chunk 7: 41 samples, 14 classes

Chunk 8: 45 samples, 13 classes

============================================================

TRAINING DRIFT-RESISTANT MODELS ON CHUNK 1

============================================================

Warning: Chunk 1 has class with only 1 sample. Using regular split.

--- Training LOGISTIC\_REGRESSION on chunk 1 ---

Val Accuracy: 0.3333, Val F1: 0.3889

Stability: 0.6921

New best chunk for logistic\_regression: 1 (Adj. Score: 0.4581)

--- Training RANDOM\_FOREST on chunk 1 ---

Val Accuracy: 0.1111, Val F1: 0.1111

Stability: 0.5334

New best chunk for random\_forest: 1 (Adj. Score: 0.1644)

--- Training DECISION\_TREE on chunk 1 ---

Val Accuracy: 0.0000, Val F1: 0.0000

Stability: 0.7275

New best chunk for decision\_tree: 1 (Adj. Score: 0.0727)

--- Training NEURAL\_NETWORK on chunk 1 ---

Val Accuracy: 0.1111, Val F1: 0.0222

Stability: 0.9794

New best chunk for neural\_network: 1 (Adj. Score: 0.1202)

--- Training SVM on chunk 1 ---

Val Accuracy: 0.1111, Val F1: 0.1111

Stability: 0.9406

New best chunk for svm: 1 (Adj. Score: 0.2052)

============================================================

TRAINING DRIFT-RESISTANT MODELS ON CHUNK 2

============================================================

Warning: Chunk 2 has class with only 1 sample. Using regular split.

--- Training LOGISTIC\_REGRESSION on chunk 2 ---

Val Accuracy: 0.3333, Val F1: 0.3333

Stability: 0.5915

--- Training RANDOM\_FOREST on chunk 2 ---

Val Accuracy: 0.1111, Val F1: 0.1481

Stability: 0.5377

New best chunk for random\_forest: 2 (Adj. Score: 0.2019)

--- Training DECISION\_TREE on chunk 2 ---

Val Accuracy: 0.3333, Val F1: 0.2778

Stability: 0.6975

New best chunk for decision\_tree: 2 (Adj. Score: 0.3475)

--- Training NEURAL\_NETWORK on chunk 2 ---

Val Accuracy: 0.0000, Val F1: 0.0000

Stability: 0.9872

--- Training SVM on chunk 2 ---

Val Accuracy: 0.1111, Val F1: 0.1481

Stability: 0.6830

New best chunk for svm: 2 (Adj. Score: 0.2165)

============================================================

TRAINING DRIFT-RESISTANT MODELS ON CHUNK 3

============================================================

Warning: Chunk 3 has class with only 1 sample. Using regular split.

--- Training LOGISTIC\_REGRESSION on chunk 3 ---

Val Accuracy: 0.3333, Val F1: 0.3148

Stability: 0.6038

--- Training RANDOM\_FOREST on chunk 3 ---

Val Accuracy: 0.3333, Val F1: 0.3333

Stability: 0.6622

New best chunk for random\_forest: 3 (Adj. Score: 0.3996)

--- Training DECISION\_TREE on chunk 3 ---

Val Accuracy: 0.1111, Val F1: 0.1111

Stability: 0.7719

--- Training NEURAL\_NETWORK on chunk 3 ---

Val Accuracy: 0.0000, Val F1: 0.0000

Stability: 0.9928

--- Training SVM on chunk 3 ---

Val Accuracy: 0.2222, Val F1: 0.2222

Stability: 0.9080

New best chunk for svm: 3 (Adj. Score: 0.3130)

============================================================

TRAINING DRIFT-RESISTANT MODELS ON CHUNK 4

============================================================

Warning: Chunk 4 has class with only 1 sample. Using regular split.

--- Training LOGISTIC\_REGRESSION on chunk 4 ---

Val Accuracy: 0.5556, Val F1: 0.5185

Stability: 0.7400

New best chunk for logistic\_regression: 4 (Adj. Score: 0.5925)

--- Training RANDOM\_FOREST on chunk 4 ---

Val Accuracy: 0.2222, Val F1: 0.2037

Stability: 0.5600

--- Training DECISION\_TREE on chunk 4 ---

Val Accuracy: 0.2222, Val F1: 0.1481

Stability: 0.6129

--- Training NEURAL\_NETWORK on chunk 4 ---

Val Accuracy: 0.0000, Val F1: 0.0000

Stability: 0.9983

--- Training SVM on chunk 4 ---

Val Accuracy: 0.4444, Val F1: 0.3889

Stability: 0.6813

New best chunk for svm: 4 (Adj. Score: 0.4570)

============================================================

TRAINING DRIFT-RESISTANT MODELS ON CHUNK 5

============================================================

Warning: Chunk 5 has class with only 1 sample. Using regular split.

--- Training LOGISTIC\_REGRESSION on chunk 5 ---

Val Accuracy: 0.2222, Val F1: 0.1852

Stability: 0.5322

--- Training RANDOM\_FOREST on chunk 5 ---

Val Accuracy: 0.2222, Val F1: 0.1296

Stability: 0.5417

--- Training DECISION\_TREE on chunk 5 ---

Val Accuracy: 0.1111, Val F1: 0.1111

Stability: 0.6170

--- Training NEURAL\_NETWORK on chunk 5 ---

Val Accuracy: 0.0000, Val F1: 0.0000

Stability: 0.9884

--- Training SVM on chunk 5 ---

Val Accuracy: 0.1111, Val F1: 0.1111

Stability: 0.6411

============================================================

TRAINING DRIFT-RESISTANT MODELS ON CHUNK 6

============================================================

Warning: Chunk 6 has class with only 1 sample. Using regular split.

--- Training LOGISTIC\_REGRESSION on chunk 6 ---

Val Accuracy: 0.2222, Val F1: 0.1852

Stability: 0.5680

--- Training RANDOM\_FOREST on chunk 6 ---

Val Accuracy: 0.2222, Val F1: 0.1667

Stability: 0.5327

--- Training DECISION\_TREE on chunk 6 ---

Val Accuracy: 0.1111, Val F1: 0.0370

Stability: 0.6867

--- Training NEURAL\_NETWORK on chunk 6 ---

Val Accuracy: 0.1111, Val F1: 0.0222

Stability: 0.9929

New best chunk for neural\_network: 6 (Adj. Score: 0.1215)

--- Training SVM on chunk 6 ---

Val Accuracy: 0.2222, Val F1: 0.1852

Stability: 0.5480

============================================================

TRAINING DRIFT-RESISTANT MODELS ON CHUNK 7

============================================================

Warning: Chunk 7 has class with only 1 sample. Using regular split.

--- Training LOGISTIC\_REGRESSION on chunk 7 ---

Val Accuracy: 0.4444, Val F1: 0.4074

Stability: 0.6443

--- Training RANDOM\_FOREST on chunk 7 ---

Val Accuracy: 0.2222, Val F1: 0.2222

Stability: 0.5804

--- Training DECISION\_TREE on chunk 7 ---

Val Accuracy: 0.2222, Val F1: 0.1630

Stability: 0.7501

--- Training NEURAL\_NETWORK on chunk 7 ---

Val Accuracy: 0.0000, Val F1: 0.0000

Stability: 0.9767

--- Training SVM on chunk 7 ---

Val Accuracy: 0.1111, Val F1: 0.1111

Stability: 0.6220

============================================================

TRAINING DRIFT-RESISTANT MODELS ON CHUNK 8

============================================================

Warning: Chunk 8 has class with only 1 sample. Using regular split.

--- Training LOGISTIC\_REGRESSION on chunk 8 ---

Val Accuracy: 0.2222, Val F1: 0.2222

Stability: 0.5816

--- Training RANDOM\_FOREST on chunk 8 ---

Val Accuracy: 0.0000, Val F1: 0.0000

Stability: 0.4750

--- Training DECISION\_TREE on chunk 8 ---

Val Accuracy: 0.0000, Val F1: 0.0000

Stability: 0.6165

--- Training NEURAL\_NETWORK on chunk 8 ---

Val Accuracy: 0.1111, Val F1: 0.0222

Stability: 0.9340

--- Training SVM on chunk 8 ---

Val Accuracy: 0.3333, Val F1: 0.2963

Stability: 0.7804

Saved 40 chunk models

==================================================

FINDING BEST CHUNK MODELS

==================================================

logistic\_regression | Best chunk: 4 | f1\_score: 0.5185

random\_forest | Best chunk: 3 | f1\_score: 0.3333

decision\_tree | Best chunk: 2 | f1\_score: 0.2778

neural\_network | Best chunk: 6 | f1\_score: 0.0222

svm | Best chunk: 4 | f1\_score: 0.3889

==================================================

CREATING DRIFT-RESISTANT ENSEMBLE MODEL

==================================================

logistic\_regression | Weight: 0.6293 | F1: 0.5185 | Stability: 0.7400

random\_forest | Weight: 0.4978 | F1: 0.3333 | Stability: 0.6622

decision\_tree | Weight: 0.4876 | F1: 0.2778 | Stability: 0.6975

neural\_network | Weight: 0.5076 | F1: 0.0222 | Stability: 0.9929

svm | Weight: 0.5351 | F1: 0.3889 | Stability: 0.6813

Created ensemble with 5 models

Ensemble model saved to: batchy-streamy/batch\_5/best\_models/ensemble\_model.pkl

DRIFT-RESISTANT TRAINING COMPLETED!

Models saved in: batchy-streamy/batch\_5/models

Chunks processed: 8

Models trained: 5

STEP 3: DRIFT ANALYSIS

Simulating drift analysis...

ITERATION EVALUATION:

Data Drift: 0.0862

Concept Drift: 0.0375

Combined Drift: 0.0421

Target Threshold: 0.0300

NEW BEST! (Previous best: 0.0421)

CONTINUING IMPROVEMENT...

Completed 4/5 iterations

ITERATION 5/5

================================================================================

ITERATION 5 - CONTINUOUS IMPROVEMENT CYCLE

================================================================================

STEP 1: DATA AUGMENTATION

Configuration loaded from ci-config.yaml

STARTING DATA AUGMENTATION PIPELINE

==================================================

Created batch structure: batchy-streamy/batch\_6

Found data at: balanced\_dataset.csv

Loaded data: (272, 12)

Columns: ['created\_at', 'title', 'industry', 'year', 'source\_url', 'company', 'application\_tags', 'tools\_tags', 'extra\_tags', 'techniques\_tags', 'short\_summary', 'full\_summary']

Detected - Text: 'full\_summary', Label: 'industry'

Cleaned data shape: (272, 12)

Step 1: Text augmentation...

Starting augmentation for 16 classes...

Augmenting class 'Finance': 17 -> 100 samples

Augmenting class 'Insurance': 17 -> 100 samples

Augmenting class 'Media & Entertainment': 17 -> 100 samples

Augmenting class 'Legal': 17 -> 100 samples

Augmenting class 'Government': 17 -> 100 samples

Augmenting class 'Automotive': 17 -> 100 samples

Augmenting class 'Telecommunications': 17 -> 100 samples

Augmenting class 'E-commerce': 17 -> 100 samples

Augmenting class 'Education': 17 -> 100 samples

Augmenting class 'Energy': 17 -> 100 samples

Augmenting class 'Consulting': 17 -> 100 samples

Augmenting class 'HR': 17 -> 100 samples

Augmenting class 'Research & Academia': 17 -> 100 samples

Augmenting class 'Healthcare': 17 -> 100 samples

Augmenting class 'Tech': 17 -> 100 samples

Augmenting class 'Other': 17 -> 100 samples

Augmented 57 new samples

Step 2: Class balancing...

Balancing 16 classes to 24 samples each...

Balanced 'Finance': 22 -> 24 samples

Balanced 'Consulting': 22 -> 24 samples

Balanced 'Telecommunications': 21 -> 24 samples

Balanced 'Healthcare': 21 -> 24 samples

Balanced 'Energy': 21 -> 24 samples

Balanced 'E-commerce': 21 -> 24 samples

Balanced 'Legal': 20 -> 24 samples

Balanced 'HR': 20 -> 24 samples

Balanced 'Education': 19 -> 24 samples

Balanced 'Automotive': 19 -> 24 samples

Balanced 'Tech': 19 -> 24 samples

Balanced 'Research & Academia': 19 -> 24 samples

Balanced 'Other': 19 -> 24 samples

Balanced 'Government': 18 -> 24 samples

Balanced data from 329 to 384 samples

Dataset enhanced: 272 -> 384 samples

Enhanced dataset saved to: batchy-streamy/batch\_6/data/enhanced\_dataset.csv

Training data: 307 samples

Test data: 77 samples

Batch 6 preparation complete!

STEP 2: DRIFT-RESISTANT TRAINING

Configuration loaded successfully from ci-config.yaml

STARTING DRIFT-RESISTANT TRAINING PIPELINE

==================================================

Loaded enhanced training data: (307, 12)

Auto-detected columns - Text: 'full\_summary', Label: 'industry'

Using text column: 'full\_summary'

Using label column: 'industry'

Created drift-resistant features: (307, 800)

Feature shape: (307, 800)

Number of classes: 16

Initialized 5 drift-resistant models:

logistic\_regression

random\_forest

decision\_tree

neural\_network

svm

Creating 8 stable chunks from 307 samples...

Class distribution: {np.int64(0): np.int64(20), np.int64(1): np.int64(20), np.int64(2): np.int64(19), np.int64(3): np.int64(19), np.int64(4): np.int64(19), np.int64(5): np.int64(20), np.int64(6): np.int64(19), np.int64(7): np.int64(19), np.int64(8): np.int64(19), np.int64(9): np.int64(19), np.int64(10): np.int64(19), np.int64(11): np.int64(19), np.int64(12): np.int64(19), np.int64(13): np.int64(19), np.int64(14): np.int64(19), np.int64(15): np.int64(19)}

Chunk 1: 38 samples, 15 classes

Chunk 2: 38 samples, 15 classes

Chunk 3: 38 samples, 14 classes

Chunk 4: 38 samples, 15 classes

Chunk 5: 38 samples, 15 classes

Chunk 6: 38 samples, 14 classes

Chunk 7: 38 samples, 15 classes

Chunk 8: 41 samples, 16 classes

============================================================

TRAINING DRIFT-RESISTANT MODELS ON CHUNK 1

============================================================

Warning: Chunk 1 has class with only 1 sample. Using regular split.

--- Training LOGISTIC\_REGRESSION on chunk 1 ---

Val Accuracy: 0.3750, Val F1: 0.2917

Stability: 0.6242

New best chunk for logistic\_regression: 1 (Adj. Score: 0.3541)

--- Training RANDOM\_FOREST on chunk 1 ---

Val Accuracy: 0.1250, Val F1: 0.1250

Stability: 0.5454

New best chunk for random\_forest: 1 (Adj. Score: 0.1795)

--- Training DECISION\_TREE on chunk 1 ---

Val Accuracy: 0.1250, Val F1: 0.0417

Stability: 0.7251

New best chunk for decision\_tree: 1 (Adj. Score: 0.1142)

--- Training NEURAL\_NETWORK on chunk 1 ---

Val Accuracy: 0.0000, Val F1: 0.0000

Stability: 0.9915

New best chunk for neural\_network: 1 (Adj. Score: 0.0992)

--- Training SVM on chunk 1 ---

Val Accuracy: 0.2500, Val F1: 0.1250

Stability: 0.8305

New best chunk for svm: 1 (Adj. Score: 0.2080)

============================================================

TRAINING DRIFT-RESISTANT MODELS ON CHUNK 2

============================================================

Warning: Chunk 2 has class with only 1 sample. Using regular split.

--- Training LOGISTIC\_REGRESSION on chunk 2 ---

Val Accuracy: 0.6250, Val F1: 0.6250

Stability: 0.7842

New best chunk for logistic\_regression: 2 (Adj. Score: 0.7034)

--- Training RANDOM\_FOREST on chunk 2 ---

Val Accuracy: 0.2500, Val F1: 0.2500

Stability: 0.6124

New best chunk for random\_forest: 2 (Adj. Score: 0.3112)

--- Training DECISION\_TREE on chunk 2 ---

Val Accuracy: 0.3750, Val F1: 0.3750

Stability: 0.9185

New best chunk for decision\_tree: 2 (Adj. Score: 0.4668)

--- Training NEURAL\_NETWORK on chunk 2 ---

Val Accuracy: 0.1250, Val F1: 0.0278

Stability: 0.9829

New best chunk for neural\_network: 2 (Adj. Score: 0.1261)

--- Training SVM on chunk 2 ---

Val Accuracy: 0.2500, Val F1: 0.2917

Stability: 0.8720

New best chunk for svm: 2 (Adj. Score: 0.3789)

============================================================

TRAINING DRIFT-RESISTANT MODELS ON CHUNK 3

============================================================

Warning: Chunk 3 has class with only 1 sample. Using regular split.

--- Training LOGISTIC\_REGRESSION on chunk 3 ---

Val Accuracy: 0.5000, Val F1: 0.4583

Stability: 0.7034

--- Training RANDOM\_FOREST on chunk 3 ---

Val Accuracy: 0.3750, Val F1: 0.3333

Stability: 0.6531

New best chunk for random\_forest: 3 (Adj. Score: 0.3986)

--- Training DECISION\_TREE on chunk 3 ---

Val Accuracy: 0.3750, Val F1: 0.3750

Stability: 0.7396

--- Training NEURAL\_NETWORK on chunk 3 ---

Val Accuracy: 0.0000, Val F1: 0.0000

Stability: 0.9615

--- Training SVM on chunk 3 ---

Val Accuracy: 0.1250, Val F1: 0.1250

Stability: 0.7609

============================================================

TRAINING DRIFT-RESISTANT MODELS ON CHUNK 4

============================================================

Warning: Chunk 4 has class with only 1 sample. Using regular split.

--- Training LOGISTIC\_REGRESSION on chunk 4 ---

Val Accuracy: 0.3750, Val F1: 0.2708

Stability: 0.5839

--- Training RANDOM\_FOREST on chunk 4 ---

Val Accuracy: 0.3750, Val F1: 0.3333

Stability: 0.6323

--- Training DECISION\_TREE on chunk 4 ---

Val Accuracy: 0.2500, Val F1: 0.2083

Stability: 0.7005

--- Training NEURAL\_NETWORK on chunk 4 ---

Val Accuracy: 0.0000, Val F1: 0.0000

Stability: 0.9946

--- Training SVM on chunk 4 ---

Val Accuracy: 0.1250, Val F1: 0.0278

Stability: 0.7802

============================================================

TRAINING DRIFT-RESISTANT MODELS ON CHUNK 5

============================================================

Warning: Chunk 5 has class with only 1 sample. Using regular split.

--- Training LOGISTIC\_REGRESSION on chunk 5 ---

Val Accuracy: 0.3750, Val F1: 0.3333

Stability: 0.5761

--- Training RANDOM\_FOREST on chunk 5 ---

Val Accuracy: 0.1250, Val F1: 0.0833

Stability: 0.4915

--- Training DECISION\_TREE on chunk 5 ---

Val Accuracy: 0.1250, Val F1: 0.1250

Stability: 0.6257

--- Training NEURAL\_NETWORK on chunk 5 ---

Val Accuracy: 0.0000, Val F1: 0.0000

Stability: 0.9915

--- Training SVM on chunk 5 ---

Val Accuracy: 0.0000, Val F1: 0.0000

Stability: 0.7975

============================================================

TRAINING DRIFT-RESISTANT MODELS ON CHUNK 6

============================================================

Warning: Chunk 6 has class with only 1 sample. Using regular split.

--- Training LOGISTIC\_REGRESSION on chunk 6 ---

Val Accuracy: 0.5000, Val F1: 0.5000

Stability: 0.7217

--- Training RANDOM\_FOREST on chunk 6 ---

Val Accuracy: 0.2500, Val F1: 0.2667

Stability: 0.6163

--- Training DECISION\_TREE on chunk 6 ---

Val Accuracy: 0.1250, Val F1: 0.1000

Stability: 0.5978

--- Training NEURAL\_NETWORK on chunk 6 ---

Val Accuracy: 0.0000, Val F1: 0.0000

Stability: 0.9989

--- Training SVM on chunk 6 ---

Val Accuracy: 0.0000, Val F1: 0.0000

Stability: 0.7861

============================================================

TRAINING DRIFT-RESISTANT MODELS ON CHUNK 7

============================================================

Warning: Chunk 7 has class with only 1 sample. Using regular split.

--- Training LOGISTIC\_REGRESSION on chunk 7 ---

Val Accuracy: 0.5000, Val F1: 0.5417

Stability: 0.6936

--- Training RANDOM\_FOREST on chunk 7 ---

Val Accuracy: 0.2500, Val F1: 0.2917

Stability: 0.5750

--- Training DECISION\_TREE on chunk 7 ---

Val Accuracy: 0.2500, Val F1: 0.2917

Stability: 0.7537

--- Training NEURAL\_NETWORK on chunk 7 ---

Val Accuracy: 0.2500, Val F1: 0.1000

Stability: 0.9614

New best chunk for neural\_network: 7 (Adj. Score: 0.1961)

--- Training SVM on chunk 7 ---

Val Accuracy: 0.1250, Val F1: 0.0500

Stability: 0.7413

============================================================

TRAINING DRIFT-RESISTANT MODELS ON CHUNK 8

============================================================

Warning: Chunk 8 has class with only 1 sample. Using regular split.

--- Training LOGISTIC\_REGRESSION on chunk 8 ---

Val Accuracy: 0.3333, Val F1: 0.2963

Stability: 0.6097

--- Training RANDOM\_FOREST on chunk 8 ---

Val Accuracy: 0.2222, Val F1: 0.1852

Stability: 0.5727

--- Training DECISION\_TREE on chunk 8 ---

Val Accuracy: 0.4444, Val F1: 0.3519

Stability: 0.8012

--- Training NEURAL\_NETWORK on chunk 8 ---

Val Accuracy: 0.1111, Val F1: 0.0222

Stability: 0.9919

--- Training SVM on chunk 8 ---

Val Accuracy: 0.3333, Val F1: 0.1926

Stability: 0.8830

Saved 40 chunk models

==================================================

FINDING BEST CHUNK MODELS

==================================================

logistic\_regression | Best chunk: 2 | f1\_score: 0.6250

random\_forest | Best chunk: 3 | f1\_score: 0.3333

decision\_tree | Best chunk: 2 | f1\_score: 0.3750

neural\_network | Best chunk: 7 | f1\_score: 0.1000

svm | Best chunk: 2 | f1\_score: 0.2917

==================================================

CREATING DRIFT-RESISTANT ENSEMBLE MODEL

==================================================

logistic\_regression | Weight: 0.7046 | F1: 0.6250 | Stability: 0.7842

random\_forest | Weight: 0.4932 | F1: 0.3333 | Stability: 0.6531

decision\_tree | Weight: 0.6467 | F1: 0.3750 | Stability: 0.9185

neural\_network | Weight: 0.5307 | F1: 0.1000 | Stability: 0.9614

svm | Weight: 0.5818 | F1: 0.2917 | Stability: 0.8720

Created ensemble with 5 models

Ensemble model saved to: batchy-streamy/batch\_6/best\_models/ensemble\_model.pkl

DRIFT-RESISTANT TRAINING COMPLETED!

Models saved in: batchy-streamy/batch\_6/models

Chunks processed: 8

Models trained: 5

STEP 3: DRIFT ANALYSIS

Simulating drift analysis...

ITERATION EVALUATION:

Data Drift: 0.0993

Concept Drift: 0.0413

Combined Drift: 0.0635

Target Threshold: 0.0300

CONTINUING IMPROVEMENT...

Completed 5/5 iterations

================================================================================

CONTINUOUS IMPROVEMENT FINAL REPORT

================================================================================

ITERATION HISTORY:

Iteration 1 | Data: 0.0533 | Concept: 0.0546 | Combined: 0.0788

Iteration 2 | Data: 0.0705 | Concept: 0.0318 | Combined: 0.0633

Iteration 3 | Data: 0.0857 | Concept: 0.0567 | Combined: 0.0679

Iteration 4 | Data: 0.0862 | Concept: 0.0375 | Combined: 0.0421

Iteration 5 | Data: 0.0993 | Concept: 0.0413 | Combined: 0.0635

BEST ITERATION: 4

Best Combined Drift Score: 0.0421

Location: batchy-streamy/batch\_5

Training Samples: 332

Models Trained: 5

IMPROVEMENT SUMMARY:

Initial Drift: 0.0788

Final Drift: 0.0635

Improvement: 0.0153 (19.4%)

CONTINUE: Target not reached after 5 iterations

PIPELINE COMPLETED!

Best Iteration: 4

Best Drift Score: 0.0421

Best Model Location: batchy-streamy/batch\_5

best\_iteration\_measure =====batchy-streamy/batch\_5

Batch path: batchy-streamy/batch\_5

Test data path: batchy-streamy/batch\_5/data/test\_data.csv

Starting real drift measurement

Loading trained chunk models...

Preparing fixed test dataset...

Test data: 84 samples, 16 classes

Validating all chunk models on fixed test data...

Testing logistic\_regression...

Testing random\_forest...

Testing decision\_tree...

Testing neural\_network...

Testing svm...

Finding best model across chunks...

Generating comprehensive drift report...

================================================================================

REAL DRIFT VALIDATION REPORT

================================================================================

OVERALL DRIFT SUMMARY:

logistic\_regression | Avg Drift: -0.0238 | Std: 0.1020

random\_forest | Avg Drift: -0.0813 | Std: 0.0804

decision\_tree | Avg Drift: -0.0367 | Std: 0.0966

neural\_network | Avg Drift: -0.0223 | Std: 0.0484

svm | Avg Drift: -0.0357 | Std: 0.0968

Overall Average Drift: -0.0400

Overall Drift Range: [-0.2143, 0.1151]

BEST PERFORMING MODEL:

Model: logistic\_regression (Chunk 4)

Test Accuracy: 0.4405

Accuracy Drift: 0.1151

Throughput: 166410.8 pred/sec

Latency: 0.4 ms

Reliability: 1.0000

DRIFT ANALYSIS:

Low Drift (<0.05): 9 models

Medium Drift (0.05-0.15): 27 models

High Drift (≥0.15): 4 models

RECOMMENDATIONS:

Warning: Significant performance drop on test data

Excellent: Model predictions are very consistent

Running SHAP analysis on best model...

SHAP ANALYSIS for logistic\_regression:

SHAP analysis completed and saved to PNG.

Starting complete SHAP analysis...

Starting complete SHAP analysis

Best model found: logistic\_regression (chunk 4)

Training accuracy: 0.5556

Loaded test data: (84, 12)

Analyzed features:

Total features: 800

Domain-relevant features: 758

Sample domain-relevant features:

1. ability

2. access

3. accuracy

4. accurate

5. achieved

6. achieving

7. additional

8. address

9. addressed

10. addresses

11. addressing

12. adoption

13. advanced

14. agent

15. agentic

16. agents

17. ai

18. ai agent

19. ai agents

20. ai assistant

<Figure size 1400x800 with 0 Axes>Starting complete SHAP analysis...

Starting complete SHAP analysis

Best model found: logistic\_regression (chunk 4)

Training accuracy: 0.5556

Loaded test data: (84, 12)

Analyzed features:

Total features: 800

Domain-relevant features: 758

Sample domain-relevant features:

1. ability

2. access

3. accuracy

4. accurate

5. achieved

6. achieving

7. additional

8. address

9. addressed

10. addresses

11. addressing

12. adoption

13. advanced

14. agent

15. agentic

16. agents

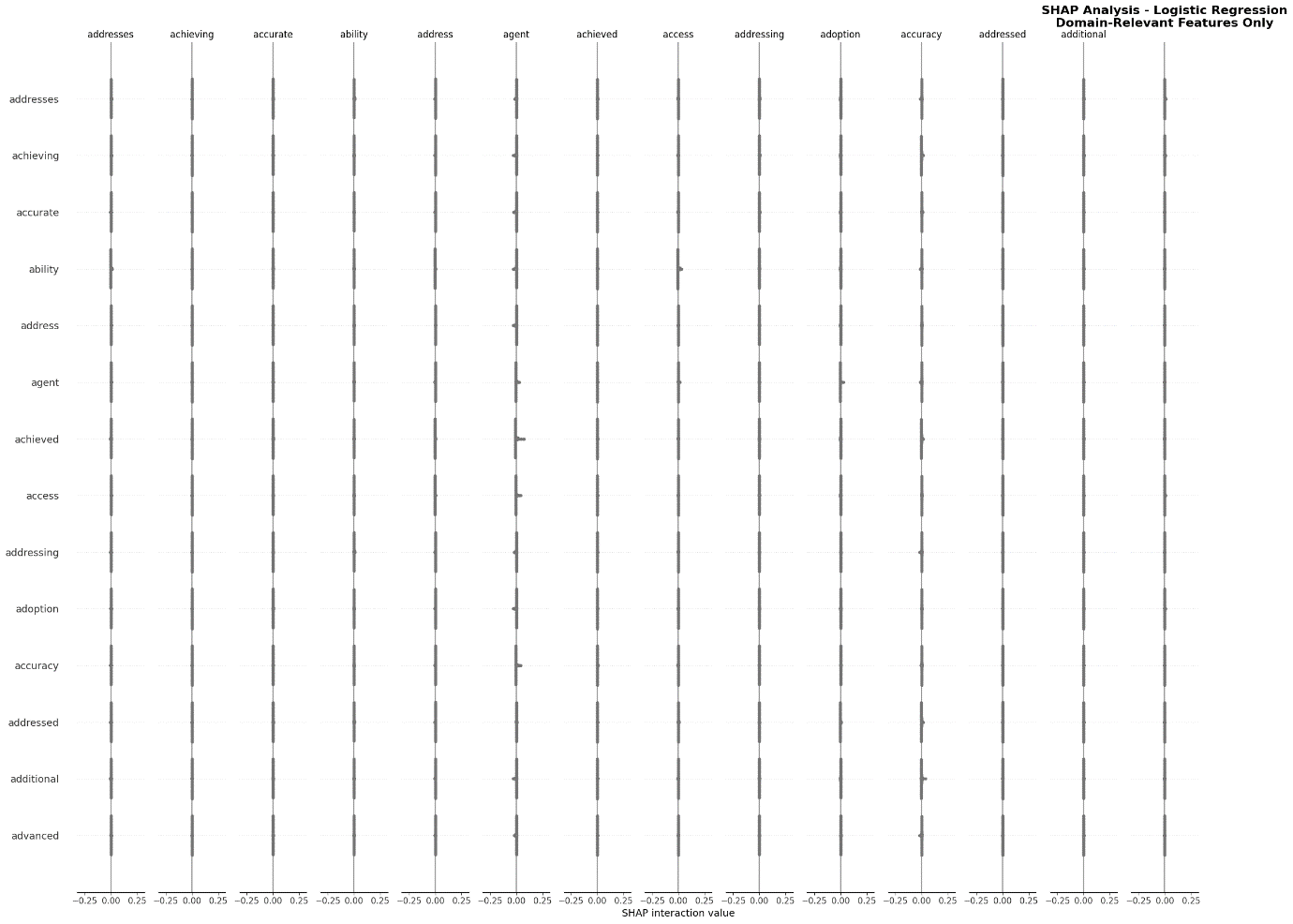
17. ai

18. ai agent

19. ai agents

20. ai assistant

<Figure size 1400x800 with 0 Axes>



Top 20 domain-relevant features:

============================================================

1. achieved | Importance: 0.0005 | General

2. ability | Importance: 0.0004 | General

3. agent | Importance: 0.0004 | General

4. addresses | Importance: 0.0003 | General

5. accurate | Importance: 0.0003 | General

6. additional | Importance: 0.0003 | General

7. achieving | Importance: 0.0003 | General

8. addressing | Importance: 0.0003 | General

9. access | Importance: 0.0003 | General

10. advanced | Importance: 0.0003 | General

11. accuracy | Importance: 0.0003 | General

12. address | Importance: 0.0003 | General

13. adoption | Importance: 0.0003 | General

14. addressed | Importance: 0.0002 | General

SHAP analysis completed successfully.

ANALYSIS COMPLETE!

SHAP plot has been generated and saved