

AI Instruction: Rag Training Guide

FATAPLUS - Plateforme Agricole Madagascar

Dernière mise à jour : 10/07/2025

FATAPLUS RAG Training Guide



Introduction au RAG (Retrieval-Augmented Generation)

Le RAG combine la récupération d'informations pertinentes avec la génération de réponses par IA pour créer un assistant agricole intelligent basé sur les données FATAPLUS.



Architecture RAG FATAPLUS

Requête Utilisateur → Embedding → Recherche Vectorielle → Contexte Récupéré → LLM → Réponse Finale

Composants Principaux

1. **Base de Données Vectorielle** (Pinecone/Weaviate)
2. **Modèle d'Embeddings** (OpenAI text-embedding-3-small)
3. **LLM Génératif** (GPT-4o)
4. **APIs FATAPLUS** (Sources de données)



Sources de Données FATAPLUS

1. Contenu Nuxt

- **Produits** : Semences, outils, équipements
- **Cours** : Formations agricoles certifiées
- **Articles** : Actualités et innovations
- **Guides** : Instructions étape par étape
- **Connaissances** : Base technique
- **Témoignages** : Histoires de réussite

2. Données Utilisateurs

- **Profils Agriculteurs** : Régions, cultures, expérience
- **Historique Conversations** : Patterns de questions
- **Feedback** : Évaluations et suggestions

3. Données Contextuelles

- **Météo Régionale** : Conditions climatiques
- **Calendrier Agricole** : Saisons et cycles
- **Prix Marchés** : Tendances économiques



Configuration Technique

1. Préparation des Données

```
# Structure des documents pour indexation
document_structure = {
  "id": "unique_identifiant",
  "type": "product|course|article|guide|knowledge|story",
  "title": "Titre du contenu",
  "content": "Contenu principal",
  "metadata": {
    "region": ["Antananarivo", "Toamasina", ...],
    "crops": ["riz", "vanille", "girofle", ...],
    "season": "saison_seche|saison_pluies|toute_annee",
    "difficulty": "debutant|intermediaire|expert",
    "tags": ["irrigation", "bio", "export", ...],
    "created_at": "2024-01-01",
    "updated_at": "2024-01-01"
  }
}
```

2. Chunking Strategy

```
# Stratégie de découpage optimisée
chunk_config = {
  "size": 1000, # Caractères par chunk
  "overlap": 200, # Chevauchement entre chunks
  "separators": ["\n\n", "\n", ".", "!", "?"],
  "preserve_structure": True # Garder les titres/sections
}
```

3. Embeddings Configuration

```
# Configuration embeddings OpenAI
embedding_config = {
  "model": "text-embedding-3-small",
  "dimensions": 1536,
  "batch_size": 100,
```

```

    "preprocessing": {
      "lowercase": True,
      "remove_special_chars": False, # Garder accents français
      "normalize_malagasy": True # Normaliser termes locaux
    }
  }
}

```



Stratégies de Recherche

1. Recherche Hybride

```

# Combinaison recherche vectorielle + filtres
search_strategy = {
  "vector_search": {
    "similarity_threshold": 0.7,
    "top_k": 20
  },
  "metadata_filters": {
    "region": "user_region",
    "season": "current_season",
    "crops": "user_crops"
  },
  "reranking": {
    "method": "cross_encoder",
    "top_k_final": 5
  }
}

```

2. Recherche Contextuelle

```

# Adaptation selon le contexte utilisateur
context_adaptation = {
  "user_profile": {
    "experience_level": "weight_difficulty",
    "preferred_language": "prioritize_language",
    "region": "boost_local_content",
    "crops": "filter_relevant_crops"
  },
  "conversation_history": {
    "recent_topics": "boost_related_content",
    "successful_recommendations": "increase_similar_content"
  }
}

```



Optimisation des Performances

1. Métriques de Qualité

```

quality_metrics = {
  "retrieval_metrics": {
    "precision@k": "relevant_docs / retrieved_docs",

```

```

    "recall@k": "relevant_docs / total_relevant",
    "mrr": "mean_reciprocal_rank",
    "ndcg": "normalized_discounted_cumulative_gain"
  },
  "generation_metrics": {
    "relevance": "pertinence_reponse",
    "factuality": "exactitude_informations",
    "completeness": "completude_reponse",
    "actionability": "applicabilite_conseils"
  }
}

```

2. A/B Testing

```

ab_testing_config = {
  "variants": {
    "embedding_models": ["text-embedding-3-small", "text-embedding-3-large"],
    "chunk_sizes": [500, 1000, 1500],
    "search_algorithms": ["cosine", "dot_product", "euclidean"],
    "reranking_methods": ["cross_encoder", "bm25", "hybrid"]
  },
  "metrics": ["user_satisfaction", "response_time", "accuracy"],
  "sample_size": 1000,
  "duration": "2_weeks"
}

```



Adaptation Madagascar

1. Vocabulaire Local

Dictionnaire termes agricoles malgaches

```

malagasy_terms = {
  "tanimbary": "rizière",
  "vary": "riz",
  "katsaka": "maïs",
  "mangahazo": "manioc",
  "voatavo": "courge",
  "akondro": "banane",
  "tavoahangy": "oignon",
  "tsaramaso": "haricot"
}

```

2. Adaptations Régionales

```

regional_adaptations = {
  "Antananarivo": {
    "climate": "highland_temperate",
    "main_crops": ["riz", "legumes", "fruits_temperes"],
    "challenges": ["erosion", "froid", "grele"]
  },
  "Toamasina": {
    "climate": "coastal_tropical",

```

```

    "main_crops": ["vanille", "girofle", "litchi"],
    "challenges": ["cyclones", "humidite", "salinite"]
  },
  "Fianarantsoa": {
    "climate": "highland_tropical",
    "main_crops": ["cafe", "the", "fruits"],
    "challenges": ["altitude", "temperature", "pluies"]
  }
}

```



Pipeline d'Entraînement

1. Ingestion de Données

```

# Workflow d'ingestion automatisée
ingestion_pipeline = {
  "sources": {
    "fataplus_api": "https://fataplus.com/api/n8n/content/all",
    "farmers_data": "https://fataplus.com/api/n8n/users/farmers",
    "external_data": ["weather_api", "market_prices"]
  },
  "processing": {
    "cleaning": "remove_duplicates_normalize_text",
    "enrichment": "add_metadata_tags",
    "validation": "check_quality_completeness"
  },
  "indexing": {
    "embeddings": "generate_store_vectors",
    "metadata": "index_searchable_fields",
    "backup": "create_versioned_snapshots"
  }
}

```

2. Entraînement Continu

```

continuous_training = {
  "schedule": {
    "daily": "new_content_indexing",
    "weekly": "performance_evaluation",
    "monthly": "model_fine_tuning",
    "quarterly": "full_reindexing"
  },
  "feedback_loop": {
    "user_ratings": "collect_response_quality",
    "conversation_analysis": "identify_improvement_areas",
    "expert_validation": "agricultural_expert_review"
  }
}

```



Outils et Technologies

Base de Données Vectorielle

```
pinecone_config:
  index_name: "fataplus-rag"
  dimension: 1536
  metric: "cosine"
  pods: 1
  replicas: 1
  metadata_config:
    indexed: ["type", "region", "crops", "season"]
```

Modèles Recommandés

```
models:
  embeddings:
    primary: "text-embedding-3-small"
    fallback: "text-embedding-ada-002"
  generation:
    primary: "gpt-4o"
    fallback: "gpt-4-turbo"
  reranking:
    primary: "cross-encoder/ms-marco-MiniLM-L-6-v2"
```



Monitoring et Maintenance

1. Dashboards de Performance

```
monitoring_metrics = {
  "response_time": "< 3 seconds",
  "accuracy": "> 85%",
  "user_satisfaction": "> 4.0/5.0",
  "coverage": "> 90% questions answered",
  "freshness": "< 24h data lag"
}
```

2. Alertes Automatiques

```
alerts_config = {
  "performance_degradation": "accuracy < 80%",
  "high_latency": "response_time > 5s",
  "low_coverage": "unanswered_questions > 15%",
  "data_staleness": "last_update > 48h",
  "error_rate": "errors > 5%"
}
```



Déploiement Production

1. Architecture Scalable

```
production_architecture:  
  load_balancer: "nginx"  
  api_gateway: "n8n_webhook"  
  vector_db: "pinecone_production"  
  llm_service: "openai_api"  
  caching: "redis"  
  monitoring: "prometheus_grafana"
```

2. Stratégie de Déploiement

```
deployment_strategy:  
  type: "blue_green"  
  testing: "automated_qa_suite"  
  rollback: "automatic_on_failure"  
  monitoring: "real_time_metrics"  
  gradual_rollout: "10_50_100_percent"
```

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Guide complet pour implémenter un système RAG de classe mondiale pour l'assistance agricole FATAPLUS.

FATAPLUS - Plateforme Agricole Numérique Madagascar

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