Palmer Penguins Multi-Model Classifier API 2.0.0 OAS 3.1

/openapi.json

```
API RESTful para clasificación de especies de pingüinos usando múltiples algoritmos de ML.

🎯 **Características principales:**
- **Múltiples algoritmos**: Logistic Regression, Random Forest, Gradient Boosting, SVM, Neural Network
- **Selección dinámica**: Cambio de modelo activo sin reiniciar el servicio
- **Comparación automática**: Métricas y rankings de todos los modelos entrenados
- **Entrenamiento on-demand**: Re-entrenamiento de algoritmos via API
- **A/B Testing**: Soporte nativo para experimentación con modelos

🐧 **Dataset**: Palmer Penguins - Clasificación entre especies Adelie, Chinstrap, y Gentoo

🚀 **MLOps Ready**: Versionado, logging, monitoring y gestión completa del ciclo de vida
```

Contact MLOps Team

MIT

default

GET / Root

Endpoint raíz que proporciona información general sobre el API.

Este endpoint actúa como "health check" básico y punto de entrada para desarrolladores explorando el API.

Parameters

Cancel

No parameters

Execute	Clear

Responses

Curl

```
curl -X 'GET' \
  'http://localhost:8989/' \
  -H 'accept: application/json'
```

Request URL

```
http://localhost:8989/
```

Server response

Code	Details

200

Response body

```
  "service": "Palmer Penguins Multi-Model Classifier",
  "version": "2.0.0",
  "status": "active",
  "model_loaded": true,
  "active_model": "svm_rbf",
  "model_load_time": "2025-08-25T03:48:53.553593",
  "features": {
    "multi_model_support": true,
    "dynamic_model_switching": true,
    "auto_comparison": true,
    "on_demand_training": true
  },
  "endpoints": {
    "/predict/simple": "Predicción con entrada user-friendly",
    "/predict/complete": "Predicción con one-hot encoding explícito",
```

Code	Details

```
      "/model/info": "Información sobre el modelo activo",
      "/model/reload": "Recargar modelo activo",
      "/models/list": "Listar todos los modelos disponibles",
      "/models/activate/{model_name}": "Activar un modelo específico",
      "/models/comparison": "Comparación detallada entre modelos",
      "/models/train": "Entrenar múltiples modelos",
      "/models/{model_name}": "Eliminar un modelo específico",
      "/docs": "Documentación interactiva (Swagger UI)",
      "/redoc": "Documentación alternativa (ReDoc)"
    },
    "request_id": "46b32228"
```

Download

Response headers

```
content-length: 973
content-type: application/json
date: Mon,25 Aug 2025 03:54:56 GMT
server: uvicorn
```

Responses

Code	Description	Links
200	Successful Response	*No lin...*

Media type

application/json ▾

Controls `Accept` header.

Example Value | Schema

```
{}
```

| GET | **/health** Health Check | ⌃ |

Endpoint de salud comprehensivo para monitoring y orchestration.

Este endpoint es fundamental para sistemas de producción donde tools como Kubernetes necesitan verificar la salud del servicio.

Parameters

Cancel

No parameters

| Execute | Clear |

Responses

Curl

```
curl -X 'GET' \
  'http://localhost:8989/health' \
  -H 'accept: application/json'
```

Request URL

```
http://localhost:8989/health
```

Server response

Code	Details

200

Response body

```
{
  "status": "healthy",
  "model_loaded": true,
  "scaler_loaded": true,
  "timestamp": "2025-08-25T03:55:06.827185",
  "version": "2.0.0"
}
```

Download

Response headers

Code	Details
|      | ```
content-length: 120
content-type: application/json
date: Mon,25 Aug 2025 03:55:05 GMT
server: uvicorn
``` |

Responses

Code	Description	Links
200	Successful Response	*No links*

Media type

<div>application/json ⌄</div>

Controls `Accept` header.

Example Value | Schema

```
{
  "model_loaded": true,
  "scaler_loaded": true,
  "status": "healthy",
  "timestamp": "2024-01-15T10:30:00Z",
  "version": "1.0.0"
}
```

GET **/model/info** Get Model Info   ⌃

Obtener información detallada sobre el modelo actualmente activo.

Este endpoint es crucial para debugging, auditing, y verificación de que el modelo correcto está siendo usado en producción.

Parameters   Cancel

No parameters

Execute   **Clear**

Responses

Curl

```
curl -X 'GET' \
  'http://localhost:8989/model/info' \
  -H 'accept: application/json'
```

Request URL

```
http://localhost:8989/model/info
```

Server response

Code	Details
200	**Response body**

```
{
  "model_type": "SVC",
  "version": "2025-08-25T03:42:46.940181",
  "training_date": "2025-08-25T03:42:46.940181",
  "accuracy": 1,
  "feature_count": 0,
  "target_classes": {
    "1": "Adelie",
    "2": "Chinstrap",
    "3": "Gentoo"
  },
  "features": []
}
```

Response headers

```
content-length: 212
content-type: application/json
date: Mon,25 Aug 2025 03:55:09 GMT
```
|

Code	Details

```
server: uvicorn
```

Responses

Code	Description	Links
200	Successful Response	*No links*

Media type

application/json ▼

Controls `Accept` header.

Example Value | Schema

```json
{
  "accuracy": 0.95,
  "feature_count": 10,
  "features": [
    "bill_length_mm",
    "bill_depth_mm",
    "flipper_length_mm",
    "body_mass_g",
    "year",
    "island_Biscoe",
    "island_Dream",
    "island_Torgersen",
    "sex_female",
    "sex_male"
  ],
  "model_type": "LogisticRegression",
  "target_classes": {
    "1": "Adelie",
    "2": "Chinstrap",
    "3": "Gentoo"
  },
  "training_date": "2024-01-15T08:00:00Z",
  "version": "1.0.0"
}
```

POST `/model/reload` Reload Model ⌃

Recargar artefactos del modelo activo desde MODELS_DIR sin reiniciar el servicio.

Útil cuando un nuevo modelo ha sido guardado (por ejemplo, desde Jupyter) en el volumen compartido. Este endpoint vuelve a cargar el modelo activo, scaler y metadata, y retorna la información del modelo recién cargado.

Parameters

Cancel

No parameters

Execute	Clear

Responses

Curl

```
curl -X 'POST' \
  'http://localhost:8989/model/reload' \
  -H 'accept: application/json' \
  -d ''
```

Request URL

```
http://localhost:8989/model/reload
```

Server response

Code	Details
200	**Response body**

```
{
  "model_type": "SVC",
  "version": "2025-08-25T03:42:46.940181",
```

Code	Details

```
    "training_date": "2025-08-25T03:42:46.940181",
    "accuracy": 1,
    "feature_count": 0,
    "target_classes": {
      "1": "Adelie",
      "2": "Chinstrap",
      "3": "Gentoo"
    },
    "features": []
}
```

[Download]

Response headers

```
access-control-allow-credentials: true
access-control-allow-origin: http://localhost:8989
content-length: 212
content-type: application/json
date: Mon,25 Aug 2025 03:55:14 GMT
server: uvicorn
vary: Origin
```

Responses

Code	Description	Links
200	Successful Response	*No links*

Media type

application/json ⌄

Controls `Accept` header.

Example Value | Schema

```
{
  "accuracy": 0.95,
  "feature_count": 10,
  "features": [
    "bill_length_mm",
    "bill_depth_mm",
    "flipper_length_mm",
    "body_mass_g",
    "year",
    "island_Biscoe",
    "island_Dream",
```

Code	Description		Links

```
        "island_Torgersen",
        "sex_female",
        "sex_male"
      ],
      "model_type": "LogisticRegression",
      "target_classes": {
        "1": "Adelie",
        "2": "Chinstrap",
        "3": "Gentoo"
      },
      "training_date": "2024-01-15T08:00:00Z",
      "version": "1.0.0"
    }
```

GET /models/list List Available Models ⌃

Listar todos los modelos disponibles con sus métricas y estado.

Este endpoint proporciona una vista completa de todos los modelos entrenados, sus métricas de performance, estado de activación, y metadatos relevantes.

Parameters   Cancel

No parameters

Execute	Clear

Responses

Curl

```
curl -X 'GET' \
  'http://localhost:8989/models/list' \
  -H 'accept: application/json'
```

Request URL

```
http://localhost:8989/models/list
```

Server response

Code	Details

200

Response body

```
{
  "total_models": 5,
  "active_model": "svm_rbf",
  "best_model": "svm_rbf",
  "models": [
    {
      "name": "random_forest",
      "algorithm": "RandomForestClassifier",
      "is_active": false,
      "is_best": false,
      "test_accuracy": 1,
      "cv_accuracy": 0.9849056603773585,
      "training_time": 0.1775057315826416,
      "file_size_kb": 226.89,
      "saved_timestamp": "2025-08-25T03:42:46.922568"
    },
    {
      "name": "svm_rbf",
      "algorithm": "SVC",
      "is_active": true,
      "is_best": true,
      "test_accuracy": 1,
      "cv_accuracy": 0.9962264150943396,
      "training_time": 0.0044329166412353516,
      "file_size_kb": 9.3,
      "saved_timestamp": "2025-08-25T03:42:46.940181"
    },
    {
```

Response headers

```
 content-length: 1408
 content-type: application/json
```

Code	Details

```
date: Mon,25 Aug 2025 03:55:17 GMT
server: uvicorn
```

Responses

Code	Description	Links
200	Successful Response	*No links*

Media type

┌─────────────────────────────────┐
│ **application/json**   ⌄ │
└─────────────────────────────────┘

Controls `Accept` header.

Example Value | Schema

```json
{
  "active_model": "random_forest",
  "best_model": "gradient_boosting",
  "last_updated": "2024-01-15T10:30:00Z",
  "models": [
    {
      "algorithm": "GradientBoostingClassifier",
      "cv_accuracy": 0.972,
      "file_size_kb": 234.5,
      "is_active": false,
      "is_best": true,
      "name": "gradient_boosting",
      "saved_timestamp": "2024-01-15T10:30:00Z",
      "test_accuracy": 0.9851,
      "training_time": 8.32
    }
  ],
  "total_models": 5
}
```

POST   /models/activate/{model_name}   Activate Model   ⌃

Activar un modelo específico para uso en predicciones.

Este endpoint permite cambiar dinámicamente qué modelo se usa para predicciones sin reiniciar el servicio. Útil para A/B testing y experimentación en producción.

Parameters   **Cancel**

Name	Description
model_name * required string *(path)*	model_name

Please correct the following validation errors and try again.

- For 'model_name': Required field is not provided.

Execute

Responses

Code	Description	Links
200	Successful Response	*No links*

Media type

application/json

Controls `Accept` header.

Example Value | Schema

Code	Description	Links

```
{
  "message": "Modelo 'random_forest' activado exitosamente",
  "model_info": {
    "algorithm": "RandomForestClassifier",
    "test_accuracy": 0.975,
    "training_date": "2024-01-15T10:30:00Z"
  },
  "new_active": "random_forest",
  "previous_active": "logistic_regression",
  "success": true
}
```

422   Validation Error   *No links*

Media type

```
application/json                                    ⌄
```

Example Value | Schema

```
{
  "detail": [
    {
      "loc": [
        "string",
        0
      ],
      "msg": "string",
      "type": "string"
    }
  ]
}
```

GET `/models/comparison` Get Models Comparison   ⌃

Obtener comparación detallada entre todos los modelos entrenados.

Este endpoint proporciona métricas comparativas, rankings, y análisis detallado de performance de todos los modelos disponibles. Útil para análisis de modelos y toma de decisiones sobre qué modelo usar en producción.

Parameters

Cancel

No parameters

| Execute | Clear |

Responses

Curl

```
curl -X 'GET' \
  'http://localhost:8989/models/comparison' \
  -H 'accept: application/json'
```

Request URL

```
http://localhost:8989/models/comparison
```

Server response

| Code | Details |

200

Response body

```
{
  "experiment_info": {
    "total_models_trained": 5,
    "best_model": "svm_rbf",
    "timestamp": "2025-08-25T03:42:46.852682",
    "cv_folds": 5,
    "test_size": 0.2,
    "random_state": 42
  },
  "ranking": [
    {
      "rank": 1,
```

Code	Details

```json
      "model": "random_forest",
      "accuracy": 1
    },
    {
      "rank": 2,
      "model": "svm_rbf",
      "accuracy": 1
    },
    {
      "rank": 3,
      "model": "logistic_regression",
      "accuracy": 0.9850746268656716
    },
    {
      "rank": 4,
```

Response headers

```
content-length: 8321
content-type: application/json
date: Mon,25 Aug 2025 03:55:40 GMT
server: uvicorn
```

Responses

Code	Description	Links
200	Successful Response	*No links*

Media type

application/json ⌄

Controls `Accept` header.

Example Value | Schema

```json
{
  "experiment_info": {
    "best_model": "gradient_boosting",
    "cv_folds": 5,
    "test_size": 0.2,
    "timestamp": "2024-01-15T10:30:00Z",
    "total_models_trained": 5
  },
  "models_summary": {},
```

Code	Description	Links

```
      "ranking": [
        {
          "accuracy": 0.9851,
          "model": "gradient_boosting",
          "rank": 1
        },
        {
          "accuracy": 0.975,
          "model": "random_forest",
          "rank": 2
        }
      ]
    }
```

DELETE /models/{model_name} Delete Model ⌃

Eliminar un modelo específico del sistema.

Este endpoint permite limpiar modelos obsoletos o experimentales. Si se elimina el modelo activo, automáticamente se activará el mejor modelo disponible.

Parameters   [Try it out]

Name	Description
model_name * required `string` *(path)*	[model_name]

Responses

Code	Description	Links
200	Successful Response	No links

Media type

<div style="border:1px solid green; padding:4px; display:inline-block">application/json ▾</div>

Controls Accept header.

Example Value | Schema

```
{
  "deleted_model": "old_model",
  "message": "Modelo 'old_model' eliminado exitosamente",
  "new_active": "random_forest",
  "remaining_models": 4,
  "success": true
}
```

422	Validation Error	No links

Media type

<div style="border:1px solid #ccc; padding:4px; display:inline-block">application/json ▾</div>

Example Value | Schema

```
{
  "detail": [
    {
      "loc": [
        "string",
        0
      ],
      "msg": "string",
      "type": "string"
    }
  ]
}
```

POST /models/train Train Multiple Models ⌃

Entrenar múltiples algoritmos simultáneamente y compararlos.

Este endpoint ejecuta el pipeline completo de entrenamiento multi-modelo:

1. Procesa los datos Palmer Penguins
2. Entrena los algoritmos especificados (o todos si no se especifica)
3. Evalúa y compara todos los modelos
4. Guarda todos los artefactos
5. Opcionalmente activa el mejor modelo

Útil para experimentación con nuevos algoritmos y re-entrenamiento periódico.

Parameters   **Cancel**

No parameters

Request body required   application/json ⌄

Edit Value | Schema

```
{
  "algorithms": [
    "logistic_regression",
    "random_forest",
    "svm_rbf"
  ],
  "auto_activate_best": true,
  "cv_folds": 5,
  "test_size": 0.2
}
```

Execute	Clear

Responses

Curl

```
curl -X 'POST' \
  'http://localhost:8989/models/train' \
  -H 'accept: application/json' \
  -H 'Content-Type: application/json' \
  -d '{
  "algorithms": [
    "logistic_regression",
    "random_forest",
    "svm_rbf"
  ],
  "auto_activate_best": true,
  "cv_folds": 5,
  "test_size": 0.2
}'
```

Request URL

```
http://localhost:8989/models/train
```

Server response

Code	Details

200

Response body

```json
{
  "experiment_info": {
    "total_models_trained": 3,
    "best_model": "svm_rbf",
    "timestamp": "2025-08-25T03:56:04.275088",
    "cv_folds": 5,
    "test_size": 0.2,
    "random_state": 42
  },
  "ranking": [
    {
      "rank": 1,
      "model": "random_forest",
      "accuracy": 1
    },
    {
      "rank": 2,
      "model": "svm_rbf",
      "accuracy": 1
    },
    {
      "rank": 3,
      "model": "logistic_regression",
      "accuracy": 0.9850746268656716
    }
  ],
  "models_summary": {
    "logistic_regression": {
```

Response headers

```
access-control-allow-credentials: true
access-control-allow-origin: http://localhost:8989
content-length: 4778
content-type: application/json
date: Mon,25 Aug 2025 03:56:02 GMT
server: uvicorn
vary: Origin
```

Responses

Code	Description	Links
200	Successful Response	*No links*

Media type

application/json ⌄

Controls `Accept` header.

Example Value | Schema

```json
{
  "experiment_info": {
    "best_model": "gradient_boosting",
    "cv_folds": 5,
    "test_size": 0.2,
    "timestamp": "2024-01-15T10:30:00Z",
    "total_models_trained": 5
  },
  "models_summary": {},
  "ranking": [
    {
      "accuracy": 0.9851,
      "model": "gradient_boosting",
      "rank": 1
    },
    {
      "accuracy": 0.975,
      "model": "random_forest",
      "rank": 2
    }
  ]
}
```

Code	Description	Links
422	Validation Error	*No links*

Media type

application/json ⌄

Example Value | Schema

```json
{
  "detail": [
    {
```

Code	Description	Links

```
          "loc": [
            "string",
            0
          ],
          "msg": "string",
          "type": "string"
        }
      ]
    }
```

POST **/predict/simple** Predict Species Simple ⌃

Predecir especie usando entrada simplificada con conversión automática.

Este endpoint proporciona la experiencia más user-friendly al manejar automáticamente la conversión de valores categóricos legibles a la representación interna que requiere el modelo.

Parameters   Cancel

No parameters

Request body required   application/json ⌄

Edit Value | Schema

```json
{
  "bill_depth_mm": 18.7,
  "bill_length_mm": 39.1,
  "body_mass_g": 3750,
  "flipper_length_mm": 181,
  "island": "Torgersen",
  "sex": "Male",
  "year": 2007
}
```

Execute	Clear

Responses

Curl

```
curl -X 'POST' \
  'http://localhost:8989/predict/simple' \
  -H 'accept: application/json' \
  -H 'Content-Type: application/json' \
  -d '{
  "bill_depth_mm": 18.7,
  "bill_length_mm": 39.1,
  "body_mass_g": 3750,
  "flipper_length_mm": 181,
  "island": "Torgersen",
  "sex": "Male",
  "year": 2007
}'
```

Request URL

```
http://localhost:8989/predict/simple
```

Server response

Code	Details
200	**Response body**

```json
{
  "species": "Adelie",
  "species_code": 1,
  "confidence": 0.9863543511342877,
  "probabilities": {
    "Adelie": 0.9863543511342877,
    "Chinstrap": 0.007576079080034425,
    "Gentoo": 0.006069569785677692
  },
  "prediction_metadata": {
    "processing_time_ms": 1.16,
    "model_version": "2025-08-25T03:56:04.312903",
    "request_timestamp": "2025-08-25T03:56:12.096843",
    "active_model": "svm_rbf"
  }
}
```

Download

Response headers

```
access-control-allow-credentials: true
access-control-allow-origin: http://localhost:8989
content-length: 347
content-type: application/json
date: Mon,25 Aug 2025 03:56:11 GMT
server: uvicorn
vary: Origin
```

Responses

Code	Description	Links
200	Successful Response	*No links*

Media type

application/json ⌄

Controls `Accept` header.

Code	Description	Links

Example Value | Schema

```
{
  "confidence": 0.85,
  "prediction_metadata": {
    "model_version": "1.0.0",
    "processing_time_ms": 12.5
  },
  "probabilities": {
    "Adelie": 0.85,
    "Chinstrap": 0.1,
    "Gentoo": 0.05
  },
  "species": "Adelie",
  "species_code": 1
}
```

422   Validation Error   *No links*

Media type

```
application/json ⌄
```

Example Value | Schema

```
{
  "detail": [
    {
      "loc": [
        "string",
        0
      ],
      "msg": "string",
      "type": "string"
    }
  ]
}
```

POST   **/predict/complete**   Predict Species Complete   ⌃

Predecir especie usando características con one-hot encoding explícito.

Este endpoint está diseñado para integraciones avanzadas donde el cliente prefiere manejar la codificación categórica directamente, proporcionando mayor control sobre la entrada al modelo.

Parameters

Cancel

No parameters

Request body required

application/json ⌄

Edit Value | Schema

```
{
  "bill_depth_mm": 18.7,
  "bill_length_mm": 39.1,
  "body_mass_g": 3750,
  "flipper_length_mm": 181,
  "island_Biscoe": 0,
  "island_Dream": 0,
  "island_Torgersen": 1,
  "sex_female": 0,
  "sex_male": 1,
  "year": 2007
}
```

Execute | Clear

Responses

Curl

```
curl -X 'POST' \
  'http://localhost:8989/predict/complete' \
  -H 'accept: application/json' \
  -H 'Content-Type: application/json' \
  -d '{
  "bill_depth_mm": 18.7,
  "bill_length_mm": 39.1,
  "body_mass_g": 3750,
  "flipper_length_mm": 181,
  "island_Biscoe": 0,
  "island_Dream": 0,
  "island_Torgersen": 1,
  "sex_female": 0,
  "sex_male": 1,
  "year": 2007
}'
```

Request URL

```
http://localhost:8989/predict/complete
```

Server response

Code	Details
200	**Response body**

```
{
  "species": "Adelie",
  "species_code": 1,
  "confidence": 0.9863543511342877,
  "probabilities": {
    "Adelie": 0.9863543511342877,
    "Chinstrap": 0.007576079080034425,
    "Gentoo": 0.006069569785677692
  },
  "prediction_metadata": {
    "processing_time_ms": 0.94,
    "model_version": "2025-08-25T03:56:04.312903",
    "request_timestamp": "2025-08-25T03:56:20.067817",
    "active_model": "svm_rbf"
  }
}
```

Response headers

Code	Details

```
access-control-allow-credentials: true
access-control-allow-origin: http://localhost:8989
content-length: 347
content-type: application/json
date: Mon,25 Aug 2025 03:56:19 GMT
server: uvicorn
vary: Origin
```

Responses

Code	Description	Links
200	Successful Response	*No links*

Media type

application/json   ⌄

Controls `Accept` header.

Example Value | Schema

```json
{
  "confidence": 0.85,
  "prediction_metadata": {
    "model_version": "1.0.0",
    "processing_time_ms": 12.5
  },
  "probabilities": {
    "Adelie": 0.85,
    "Chinstrap": 0.1,
    "Gentoo": 0.05
  },
  "species": "Adelie",
  "species_code": 1
}
```

| 422 | Validation Error | *No links* |

Media type

application/json   ⌄

Example Value | Schema

Code	Description		Links

```
{
  "detail": [
    {
      "loc": [
        "string",
        0
      ],
      "msg": "string",
      "type": "string"
    }
  ]
}
```

Schemas   ⌃

HTTPValidationError › Expand all **object**

HealthResponse › Expand all **object**

IslandEnum › Expand all **string**

ModelActivationResponse › Expand all **object**

ModelComparisonResponse › Expand all **object**

ModelDeletionResponse › Expand all **object**

ModelInfoResponse >   Expand all   `object`

ModelListItem >   Expand all   `object`

ModelsListResponse >   Expand all   `object`

MultiModelTrainingRequest >   Expand all   `object`

PenguinFeaturesComplete >   Expand all   `object`

PenguinFeaturesSimple >   Expand all   `object`

PredictionResponse >   Expand all   `object`

SexEnum >   Expand all   `string`

SpeciesEnum >   Expand all   `string`

ValidationError >   Expand all   `object`