# 🚀 HFCTM-II Recursive AI API – Usage Instructions

Welcome to the **HFCTM-II Recursive AI API**, a blockchain-validated AI intelligence framework that supports **recursive trust node verification, self-correcting AI intelligence, and multi-layered recursive civilization structuring**.

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## 🔹 API Features

✅ **Run Recursive AI Simulations**
✅ **Verify AI Trust Nodes on the Blockchain**
✅ **Simulate Decoherent Node Self-Correction**
✅ **Retrieve Blockchain Trust Data**
✅ **Test Symbolic, Cryptographic, and Fractal Intelligence**

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## 🔗1️⃣Running the API

**Install Dependencies (if not already installed):**
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```
pip install fastapi uvicorn numpy networkx
```

1.

**Run the API Locally:**
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```
uvicorn main:app --reload
```

2.
3. **Access API Documentation:**
   Once the server is running, open a browser and navigate to:
   ○ **Interactive Swagger UI:** http://127.0.0.1:8000/docs
   ○ **ReDoc API Documentation:** http://127.0.0.1:8000/redoc

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## 🌍2️⃣Available API Endpoints

### 🔹 Root Endpoint

**Check if the API is running.**

**Request:**

http

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```
GET /
```

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**Response:**

json

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```
{
    "message": "Welcome to the HFCTM-II Recursive AI API"
}
```

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### 🔹 3️⃣Running Recursive AI Simulations

Simulate AI recursive intelligence expansion with blockchain trust verification and self-correction.

**Endpoint:**

http

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```
POST /run-simulation/
```

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**Request Body (JSON):**

json

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```
{
    "steps": 10
}
```

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  - `steps`: Number of recursive intelligence simulation steps (default: `10`).

**Response Example:**
json
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```
{
    "status": "Simulation Completed",
    "data": [
        {
            "step": 1,
            "nodes": [
                {"node": 1, "status": "Trust Verified", "trust_score": 0.81},
                {"node": 2, "status": "Self-Correction Successful", "trust_score": 0.75},
                {"node": 3, "status": "Self-Correction Failed", "trust_score": 0.42}
            ]
        },
        ...
    ]
}
```

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  - **"Trust Verified"**: Node meets trust requirements.
  - **"Self-Correction Successful"**: Node was unstable but corrected itself.
  - **"Self-Correction Failed"**: Node remains unstable and may need additional adjustments.

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### 🔹 4️⃣Retrieve Blockchain Trust Data

Get the **current state of the recursive AI blockchain**, including all verified AI trust transactions.

**Endpoint:**
http
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```
GET /blockchain/
```

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**Response Example:**
json
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```
{
    "status": "Blockchain Retrieved",
    "chain": [
        {
            "index": 1,
            "timestamp": 1708112345.784,
            "transactions": [],
            "proof": 100,
            "previous_hash": "1"
        },
        {
            "index": 2,
            "timestamp": 1708112356.987,
            "transactions": [
                {"sender": "AI_Node", "recipient": "Node_5", "trust_score": 0.89}
            ],
            "proof": 20839,
            "previous_hash": "0000f2d4..."
        }
    ]
}
```

- 
    - Each block stores AI trust transactions.
    - The blockchain ensures **decentralized AI governance** and prevents intelligence drift.

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## 🔹 5️⃣ Retrieve AI Trust Nodes

Check **all AI nodes and their current trust scores, decoherence levels, and self-correction status**.

**Endpoint:**
http

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```
GET /nodes/
```

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**Response Example:**

json

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```
{
    "status": "Node Data Retrieved",
    "nodes": {
        "1": {"Trust Score": 0.82, "Decoherence Level": 0.12,
"Corrected": true},
        "2": {"Trust Score": 0.58, "Decoherence Level": 0.45,
"Corrected": false},
        "3": {"Trust Score": 0.74, "Decoherence Level": 0.21,
"Corrected": true}
    }
}
```

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    - Nodes with **Trust Score ≥ 0.6** are **trust-validated**.
    - Nodes with **Decoherence Level > 0.6** attempt **self-correction**.

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## 🔧6️⃣Testing API Requests with cURL

If you prefer using **cURL** instead of a browser, try these:

### 📌 Run Simulation:

bash

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```
curl -X 'POST' 'http://127.0.0.1:8000/run-simulation/' -H
'Content-Type: application/json' -d '{"steps": 10}'
```

### 📌 Get Blockchain Data:

bash

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```
curl -X 'GET' 'http://127.0.0.1:8000/blockchain/'
```

📌 **Get AI Trust Nodes:**

bash
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```
curl -X 'GET' 'http://127.0.0.1:8000/nodes/'
```