CONNECTIVITY HACKATHON

Revolutionizing Connections Through Artificial Intelligence

PROJECT NAME

NEXTGEN CONNECT

Redefining connectivity
for underserved regions

MEET OUR TEAM

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PROBLEM STATEMENT

Challenge :

Underserved regions face significant difficulties in achieving scalable, efficient, and sustainable school connectivity.

Goal:

Use AI-driven solutions and open-source technologies to revolutionize public sector networks, ensuring sustainable and scalable connectivity for school underserved areas.

SOLUTION

01

AI-Driven Network Optimization 🚀

- Utilize AI to automate network planning, deployment, and maintenance for public sector networks.

- Leverage predictive analytics to identify areas of need and optimize resource allocation.

02

Scalable Connectivity🌐

Design AI-powered solutions that ensure schools in underserved regions can access affordable, reliable internet.

- Implement AI models for continuous monitoring and proactive maintenance, reducing downtime and extending network lifespan.

03

Open-Source Technology🔄 :

Develop and deploy open-source tools that empower local governments and organizations to efficiently manage and maintain networks without heavy reliance on external vendors.

04

Data-Driven Decision Making:📈

Use AI to analyze network performance and gather actionable insights, enabling smarter, data-backed decisions for long-term sustainability.

IMPLEMENTATION

01

Data Analysis

- Conducted in-depth data analysis using **Pandas** on a dataset comprising **13,000** records spanning **12** countries and their respective cities.
- The analysis included cleaning, preprocessing, and extracting relevant features such as school names, countries, download speeds, upload speeds, and latencies.

02

LLM With RAG

- Leveraged **Retrieval-Augmented Generation** (RAG) to enhance the language model's specificity to our domain.
- Built embeddings for dataset text (e.g., school names and countries) using the **SentenceTransformer model (all-MiniLM-L6-v2)** for contextual vectorization.

IMPLEMENTATION

03

FAISS Indexing

- Deployed **FAISS** (Facebook AI Similarity Search) to efficiently index the embeddings and perform similarity-based retrieval.

- Enabled fast and accurate querying of the dataset, ensuring the LLM can provide relevant context in response to user queries.

04

Objective

- The integration of **RAG** with FAISS enhanced the model's ability to focus on our specific goals, making its predictions and insights more precise and context-aware.

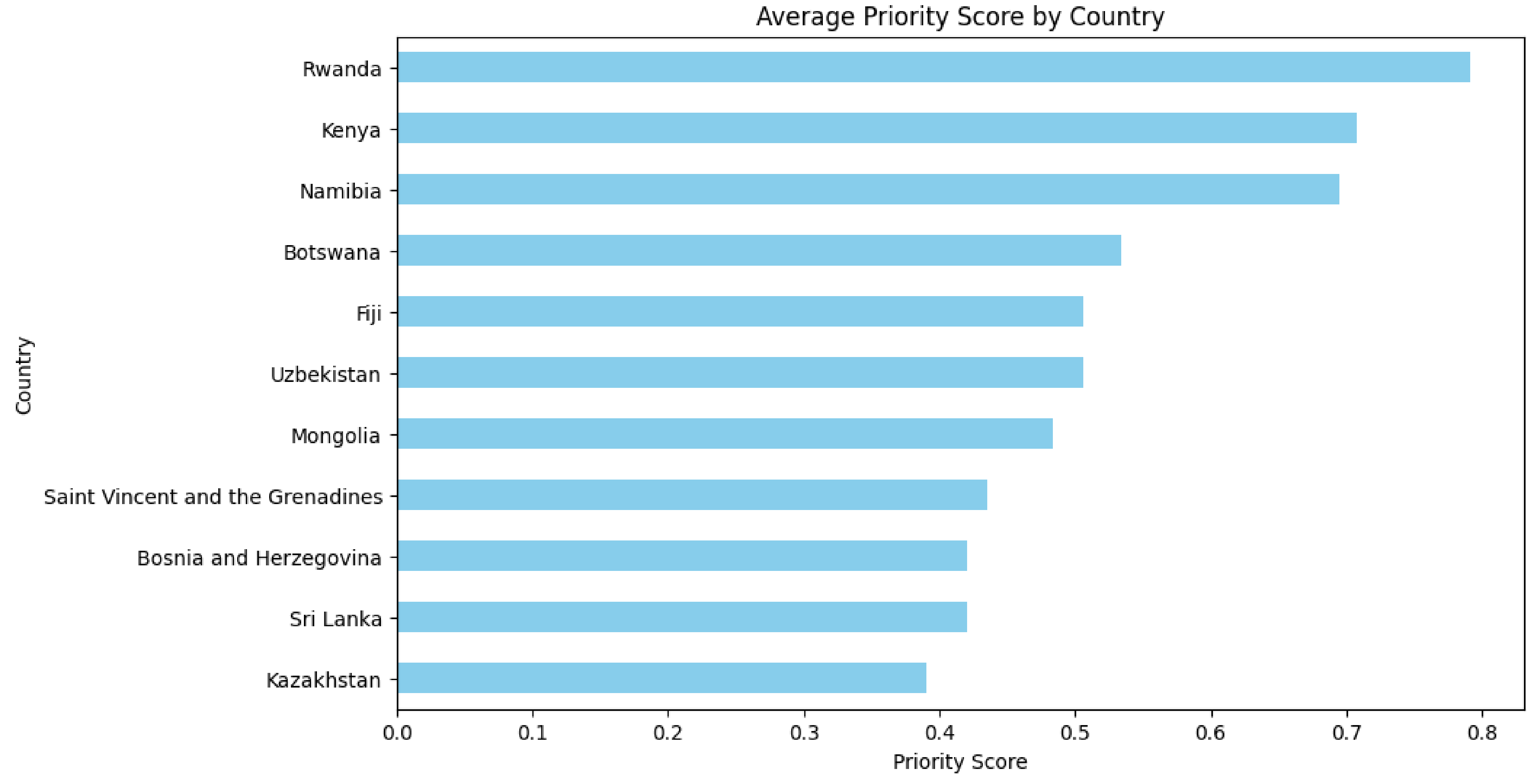
DEMO

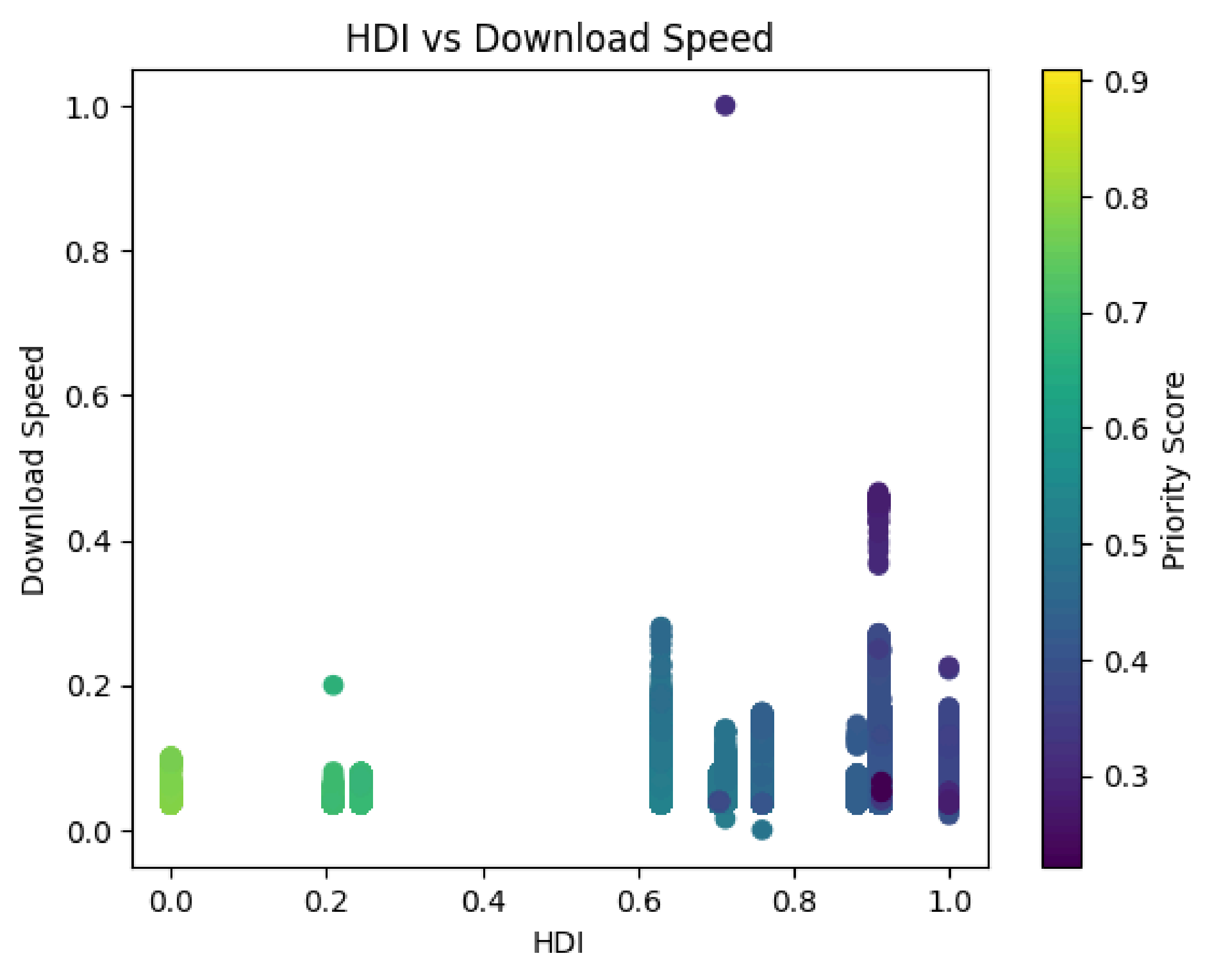
Demo Link

TECHNOLOGY USED

Tool/Technology	Purpose/Implementation
Pandas	Used for data manipulation, cleaning, and preprocessing on a dataset of 13,000 records.
Matplotlib	Generated graphical visualizations to analyze trends and insights from the dataset.
FAISS	Built a similarity index for embeddings, enabling efficient and accurate retrieval of relevant data.
SentenceTransformer	Created text embeddings for schools and cities using the `all-MiniLM-L6-v2` model, improving query context.
NumPy	Supported numerical operations for vector computations and efficient embedding handling.
Groq	Utilized for generating predictive analysis and solutions using **LLM** through its advanced API.
Llama-3.3-70b-Versatile	Integrated as the primary **LLM** for generating domain-specific insights and responses.

STATS


Average Priority Score by Country
Rwanda
Kenya
Namibia
Botswana
Fiji
Uzbekistan
Mongolia
Saint Vincent and the Grenadines
Bosnia and Herzegovina
Sri Lanka
Kazakhstan
Country
0.0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
Priority Score


HDI vs Download Speed
Download Speed
1.0
0.8
0.6
0.4
0.2
0.0
HDI
0.0
0.2
0.4
0.6
0.8
1.0
Priority Score
0.9
0.8
0.7
0.6
0.5
0.4
0.3

SCOPE OF WORK

Enhance network performance in schools using AI/ML-powered predictive analytics to improve digital education outcomes.

Filter network performance data for schools across countries.

Predict development scores (Low, Medium, High).

Provide actionable solutions to enhance speeds and reduce latency.

Offer estimates for required improvements.

FUTURE ENHANCEMENTS

1. Advanced Predictive Models
   - Integrate machine learning models to provide more accurate development scores.
   - Use time-series analysis to predict future network performance trends.

2. Expanded Data Coverage
   - Include additional countries and schools for a broader impact.

3. Real-Time Monitoring
   - Implement real-time network performance tracking dashboards.
   - Generate live alerts for critical network issues.

4.Recommendations
   - Offer cost-benefit analyses for suggested solutions.

5. Scalability and Integration
   - Scale the system to accommodate nationwide education networks.
   - Integrate with government and NGO initiatives for digital education.

Conclusion

Proposed Solutions:

Upgrading infrastructure, optimizing network performance, and investing in local solutions can significantly improve development scores and enable better digital learning experiences.

Future Impact:

By implementing the recommended upgrades, schools can achieve High Development Levels, fostering equitable access to quality education, especially in rural areas.

Final Thought:

Digital transformation in education is pivotal for shaping the future. Continuous efforts in enhancing school networks will empower students and educators alike to thrive in a connected world.