IP-NEXUS

SUPERVISED IP GEOLOCATION SYSTEM

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Mentor:
Mrs.S.M.Keerthana
Assistant Professor/CSE,
St.Joseph's Institute of Technology

Team Members:
Shrinidhi.M, Thivaan.A.P
Star Coders

PROBLEM DESCRIPTION

- Relies on static rules or outdated databases

- Mostly limited to country-level accuracy

- Gives misleading country for vpn users.

- Inaccurate city data → poor content delivery & weak fraud detection

- Need for a precise, reliable, and up-to-date city-level solution

SOLUTION PROPOSED

- To develop a city-level IP geolocation model using supervised ML
- Combine smart network & behavioral features:
  - ➔ ASN, BGP prefix, RTTs
  - ➔ Reverse DNS hints, time zones
- Ensure reliability by:
  - ➔ Handling rare cities effectively
  - ➔ Detecting tricky cases like VPNs
- Returning low-confidence predictions instead of misleading results

BGP and ASN Example

AS 100
eBGP

AS 300
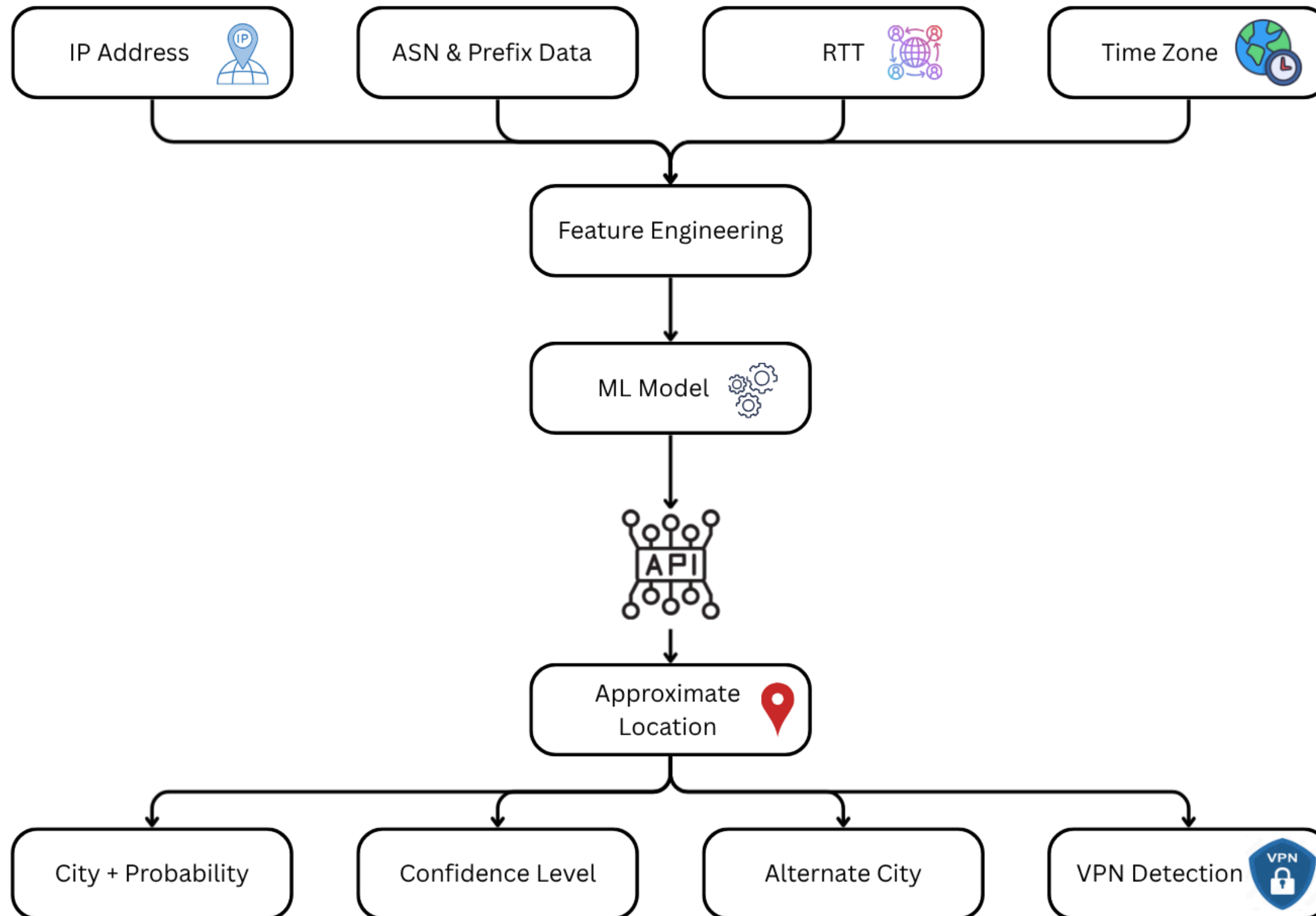eBGP

eBGP
iBGP
eBGP
AS 200
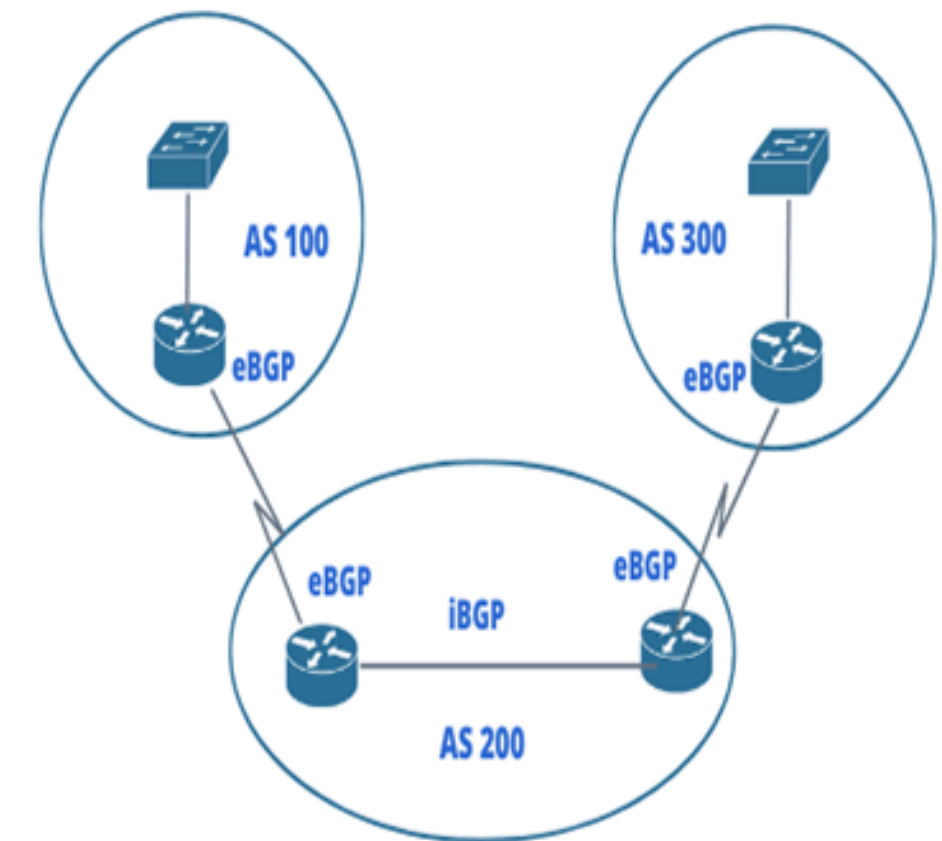
OPTIMIZATION PROPOSED BY THE TEAM

- Predict a "confidence radius" in kilometers showing how far off the location might be.

- Detect VPN and give "low confidence" prediction rather than giving a misleading city.

- Give city level prediction.

SOLUTION ARCHITECTURE AND DESIGN

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┌──────────────┐   ┌──────────────────┐   ┌──────────────┐   ┌──────────────┐
│ IP Address   │   │ ASN & Prefix Data│   │ RTT          │   │ Time Zone    │
└──────┬───────┘   └────────┬─────────┘   └──────┬───────┘   └──────┬───────┘
       └───────────────────┬┴───────────────────┴──────────────────┘
                           ▼
                  ┌──────────────────┐
                  │ Feature Engineering│
                  └────────┬─────────┘
                           ▼
                  ┌──────────────────┐
                  │ ML Model         │
                  └────────┬─────────┘
                           ▼
                         [API]
                           ▼
                  ┌──────────────────┐
                  │ Approximate      │
                  │ Location         │
                  └────────┬─────────┘
```

┌────────────────────┐ ┌────────────────────┐ ┌────────────────────┐ ┌────────────────────┐
│ City + Probability │ │ Confidence Level   │ │ Alternate City   │ │ VPN Detection   │
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TIMELINE

Requirement Analysis

8ᵗʰ October 2025

Implementation

5ˢᵗ November 2025

Final Delivery

1st January 2026

Design Completion

17ᵗʰ October 2025

Testing & Optimization

7ᵗʰ December 2025

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REFERENCES LINK 🔗

- https://www.researchgate.net/publication/342605673_Detection_of_Virtual_Private_Network_Traffic_Using_Machine_Learning

- https://www.bigdatacloud.com/blog/why-ip-geolocation-accuracy-makes-or-breaks-ad-tech

- https://docs.fortinet.com/document/fortigate/6.2.0/new-features/520349/recognize-anycast-address-in-geo-ip-blocking?utm_source=chatgpt.com

THANK YOU