Fake Job Listing Detection

Deep Learning & Agentic Generative AI

MILESTONE 1 REPORT

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The Current Landscape: A Crisis of Trust

FTC Warns of Surge in Fake Job Scams
NYTimes.com - Oct 24, 2023
Agency reports record complaints as scammers exploit remote work trends...

Thousands Fall Victim to LinkedIn Phishing Attacks
TechCrunch - Nov 15, 2023
Malicious actors impersonate recruiters to steal personal data and credentials...

The 'Ghost Job' Problem: Why Your Application is Ignored
Forbes - Dec 1, 2023
Many listings are fake or inactive, used for market research or data collection...

How Scammers Use AI to Create Convincing Job Posts
Wired - Dec 12, 2023
Generative AI tools are making it easier to create highly targeted and believable fraudulent listings...

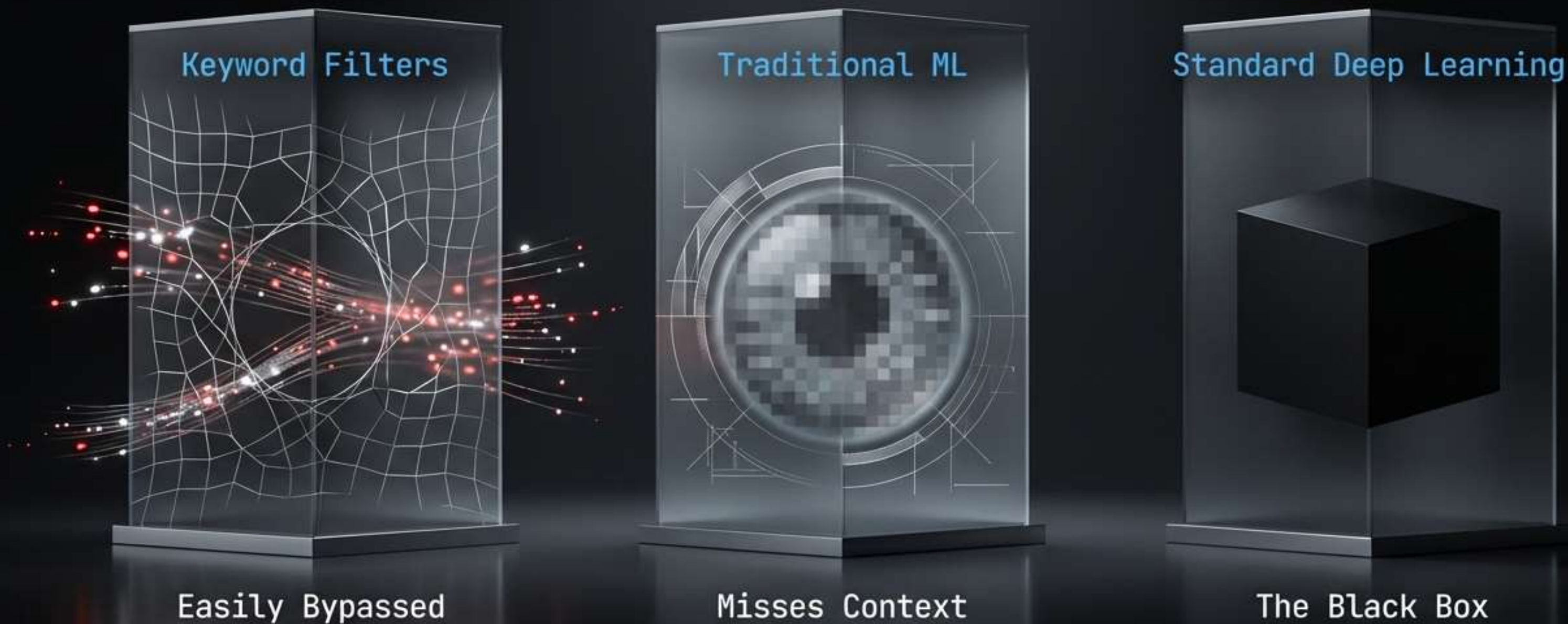**New Report: Financial Losses from Job Fraud Hit Record High**
FBI.gov - Jan 5, 2024
Victims report significant monetary losses through advance-fee fraud and identity theft...

Widespread fraud. Financial impact. Eroding confidence.

Why Current Defenses Fail

Keyword Filters

Traditional ML

Standard Deep Learning

Easily Bypassed

Misses Context

The Black Box

We need verification, not just classification.

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THE DETECTION LANDSCAPE: FIVE APPROACHES

01 RULE-BASED
Keyword Filtering. Simple matching, easily bypassed.

02 CLASSICAL ML
Naive Bayes / Random Forest. Uses TF-IDF features.

03 DEEP LEARNING
CNN / LSTM. Better context, black box.

04 TRANSFORMERS
BERT / RoBERTa. State-of-the-art text understanding.

05 EXPLAINABLE AI
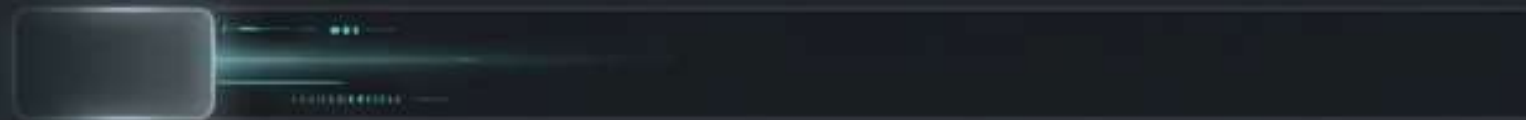**LIME / SHAP.** Feature weights, not user explanations.

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Performance Leaderboard

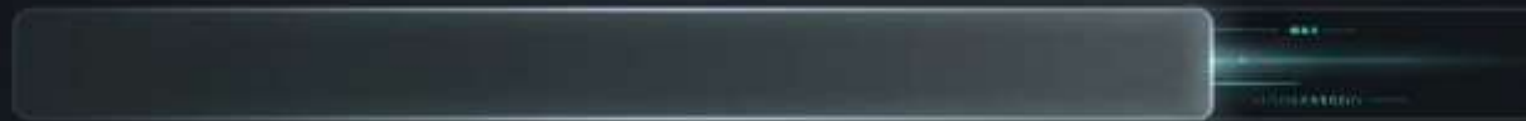Transformers define the current ceiling for text accuracy.

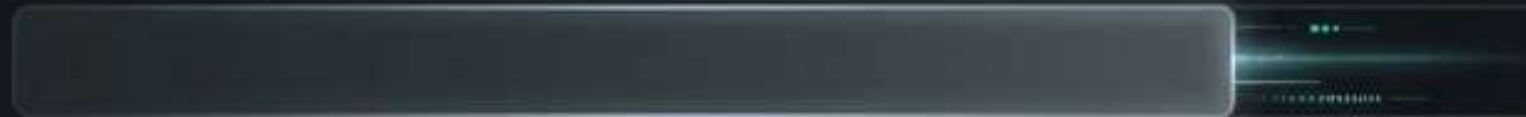| Model Approach		JetBrains Mono
Rule-Based (Keyword Filter)		Accuracy: Low | F1: Low
Classical ML (Random Forest)		Accuracy: 97% | F1: 0.82
Deep Learning (BiLSTM)		Accuracy: 97% | F1: 0.83
Transformer (BERT)		Accuracy: 98% | F1: 0.88
Transformer (RoBERTa)	Accuracy: 98.5% | F1: 0.91	✓ Best Baseline

THE BLIND SPOT: WHY HIGH ACCURACY ISN'T ENOUGH

Critical weaknesses in existing approaches.

NO METADATA VERIFICATION

Models ignore email domains, missing info, and salary ranges.

BLACK BOX PREDICTIONS

Outputs a score without explanation. Hard to trust.

POOR CLASS IMBALANCE HANDLING

Only ~4.8% of listings are fake; models miss fraud cases.

NO HUMAN-READABLE EXPLANATION

LIME/SHAP provide numbers, not plain-language reports.

Gap Analysis
Fractures in current defenses

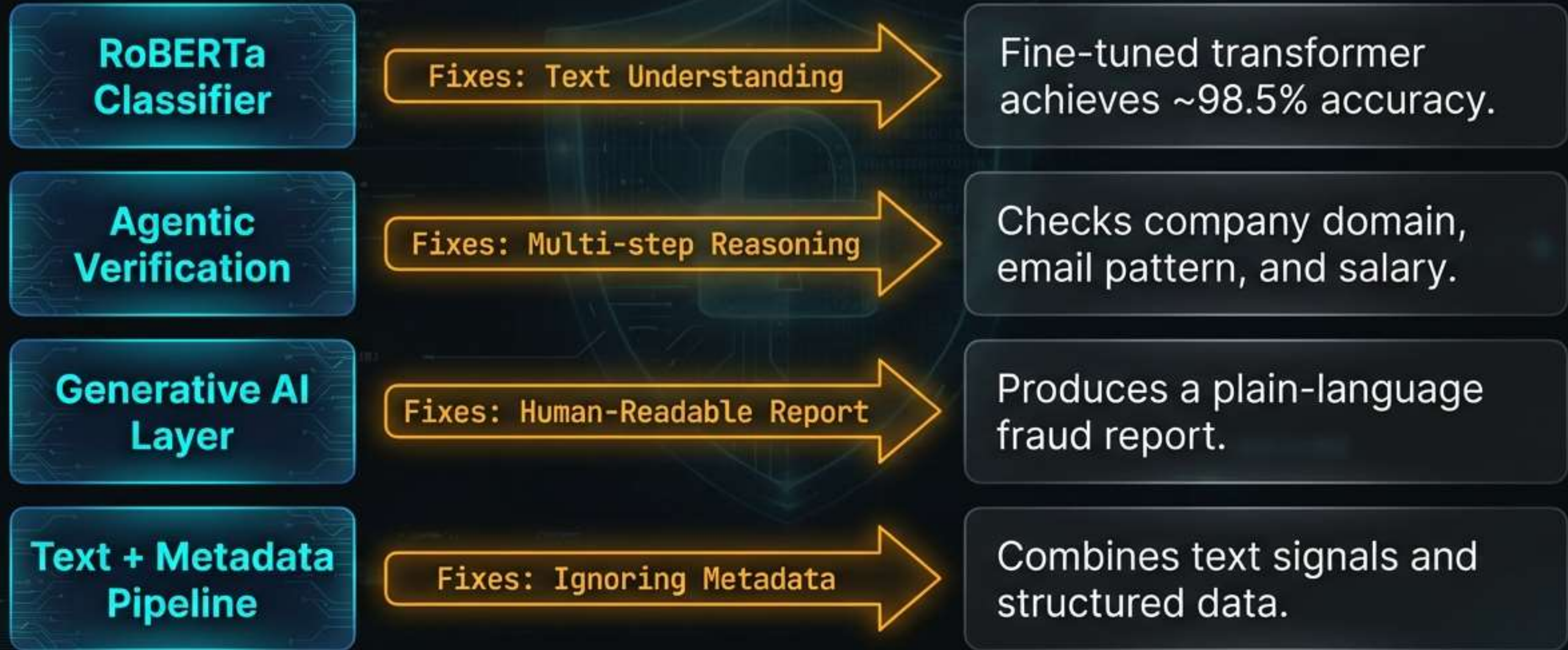Gap 1: No multi-step verification (Domain/Salary ignored)

Gap 2: No narrative explanation (Just scores)

Gap 3: Metadata is ignored (Email/Location missing)

Gap 4: Class imbalance unresolved (Low recall)

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Bridging the Gaps: The Proposed System

RoBERTa Classifier	Fixes: Text Understanding →	Fine-tuned transformer achieves ~98.5% accuracy.
Agentic Verification	Fixes: Multi-step Reasoning →	Checks company domain, email pattern, and salary.
Generative AI Layer	Fixes: Human-Readable Report →	Produces a plain-language fraud report.
Text + Metadata Pipeline	Fixes: Ignoring Metadata →	Combines text signals and structured data.

Key Differentiators

| Feature	Traditional ML	Deep Learning	Proposed System
Context Understanding (JetBrains Mono)	Low (Inter-Regular)	High (Inter-Regular)	High (Inter-Regular) ✔
Metadata Verification (JetBrains Mono)	No (Inter-Regular) ✘	No (Inter-Regular) ✘	Yes (Inter-Regular) ✔
Multi-step Reasoning (JetBrains Mono)	No (Inter-Regular) ✘	No (Inter-Regular) ✘	Yes (Inter-Regular) ✔
Structured Explanation (JetBrains Mono)	No (Inter-Regular) ✘	Limited (Inter-Regular)	Yes (Inter-Regular) ✔
Agent-Based System (JetBrains Mono)	No (Inter-Regular) ✘	No (Inter-Regular) ✘	Yes (Inter-Regular) ✔

A Hybrid Approach
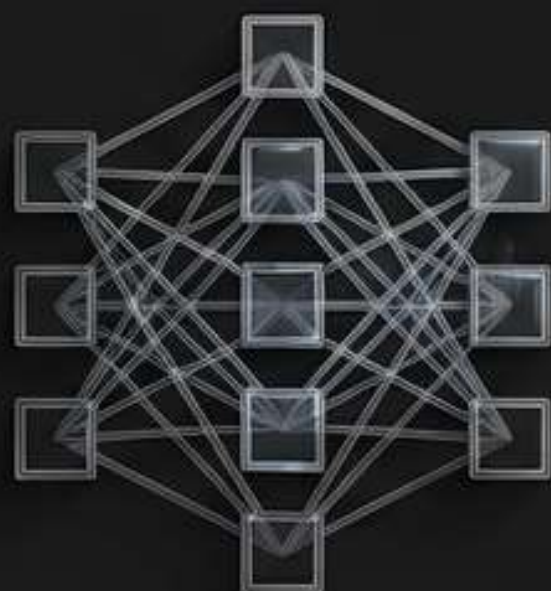
Transformer
Models

Agentic
Verification
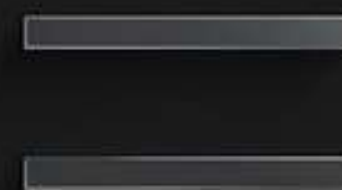
Trust &
Explainability

Combining RoBERTa for text understanding with Agents for fact-checking.

Project Context & Importance.

Why Fraud Detection Matters

- Financial Loss
- Identity Theft
- Reputational Damage
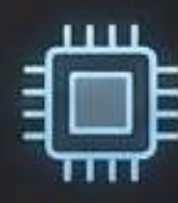
Stakeholders

- Job Seekers
- Employers
- Platforms

Current Status of Job Scams

- Increasing Volume
- Higher Sophistication
- Low Detection Rate

Scope & Boundaries

✓ In-Scope	✗ Out-of-Scope
• Text Analysis	• Legal Action
• Salary Verification	• Dark Web Monitoring
• Domain Checks	• Physical Verification

Project Analysis

- Data Collection
- Model Training
- Testing & Validation
- Deployment

Addressing the urgent need for advanced fraud detection mechanisms.

The Agentic Workflow

Domain Validator
Checks company website & email legitimacy.

Salary Ranger
Detects unrealistically high salaries vs market rates.

Metadata Scout
Flags anomalies in location or contact info.

Multi-step reasoning to cross-check suspicious attributes.

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Not Just a Score.
A Story.

Generative AI provides structured, plain-language warnings.

STATUS: SUSPICIOUS

This listing is likely fake. The salary offered is 400% above the market rate for this role, and the email domain does not match the official company website.

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The Builders (Milestone 1)

Arun Dutta

Literature Review & Gap Analysis

- State-of-the-art methods (SOTA)
- Identify existing dataset limitations

Hritik Roshan Maurya

Problem Framing & System Architecture

- Define problem scope and objectives
- Architectural diagram & module breakdown

Vivek Bajaj

Data Pipeline & Deep Learning Workflow

- Data cleaning, preprocessing, & augmentation
- Model selection, training, & hyperparameter tuning

Vishwas Mehta

Fraud Pattern Analysis & Domain Research

- Analyze common fraud tactics
- Consult with domain experts for feature engineering

Status & Next Steps

Research &
Architecture

Prototype
Development

Integration
& Testing

Milestone 1
Complete

In Progress

Upcoming

Moving from architecture to implementation.