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An Ai Based Framework For Counseling And Aptitude-Based Career Mapping

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Abstract: The Biggest Challenge for the student's now a days is to choose the correct career path. The demand for equitable and effective career counselling in Indian secondary education has never been more urgent, especially in rural and under-resourced regions where professional guidance is either inaccessible or non-existent. Existing digital platforms fail to address the linguistic, socio-economic, and cognitive diversity of students aged 13 to 17, resulting in uninformed academic choices, increased dropout rates, and long-term career misalignments. Simultaneously, the advent of Artificial Intelligence (AI) and the directives of the National Education Policy (NEP) 2020 provide an unprecedented opportunity to reimagine the delivery of career guidance at scale. It combines aptitude modelling, interpretability mechanisms via Explainable AI (XAI), and localized Natural Language Processing (NLP) to deliver personalized, context-aware guidance. The system is designed to function in both online and offline environments, ensuring adaptability in infrastructure-deficient regions.

Keywords: AI, Career-Mapping, NLP, NEP 2020.

1. Introduction

This research reveals significant technological advancements in adaptive learning, student engagement, and vocational prediction using AI. However, it also exposes critical gaps: lack of secondary school-focused frameworks, inadequate integration of psychometric data, limited linguistic inclusivity, and insufficient ethical and pedagogical grounding. By synthesizing insights from over thirty contemporary studies and addressing these gaps through a modular, transparent, and student-centric design, this research establishes a novel pathway for democratizing career guidance. The resulting framework not only supports informed student decision-making but also aligns with broader policy goals of digital equity, educational personalization, and future workforce readiness.

This paper is essential reading for researchers and practitioners who seek not only to correct bias in biometric models, but to interrogate the power structures and assumptions underlying their very existence. It identifies a strong theoretical and technical base across intrusion detection and biometric fairness, but also clearly reveals the absence of an integrated, explainable, fair, and India-contextualized AI system across both domains. In real-world scenarios, mobile and network-level threats increasingly overlap. A compromised mobile device can act as a bridge for launching enterprise-level attacks; likewise, malware detected in network flows may originate from mobile endpoints. This operational overlap necessitates integrated AI frameworks.

2. Background of the Study

The role of career counselling has expanded beyond simple vocational advice to become a critical determinant of academic performance, psychological well-being, and long-term employability. In India, this service remains inaccessible to large segments of the student population, particularly in government and rural schools, where resources are stretched thin and trained counsellors are virtually absent [1]. The mismatch between a student's aptitude and their chosen academic path often results in disengagement, increased dropout rates, and misaligned career outcomes. These systemic inefficiencies necessitate a transformation in how career guidance is conceptualized and delivered.

Through empirical evaluation on standard benchmark datasets such as NSL-KDD and CICIDS2017, the model demonstrates improved detection accuracy and a notable reduction in false positives when compared to conventional CNNs and traditional machine learning classifiers. Moreover, the study includes an ablation analysis highlighting the contribution of the proposed regularization strategy in stabilizing model convergence.

This research stands out for its methodological rigor and its alignment with SDN-specific traffic patterns, offering a deployable solution for next-generation programmable networks. The integration of adaptive regularization into CNN-based IDS pipelines reflects a promising direction for resilient and context-aware cybersecurity models in evolving infrastructure paradigms.

Specific Objectives:

- To develop and benchmark AI models for IDS and mobile biometrics.
- To Test model performance under adversarial conditions.
- To analyse demographic bias in biometric authentication.
- To evaluate user trust and consent through surveys and interviews.
- To Align implementation with India's emerging data protection policies.

3. The Evolving Landscape of Education and AI

The educational ecosystem in India is undergoing a paradigm shift catalysed by policy reforms and technological innovation. The National Education Policy (NEP) 2020 emphasizes holistic education, aptitude recognition, and technology-integrated pedagogy. Simultaneously, the field of Artificial Intelligence is maturing, with its applications being increasingly recognized in adaptive learning, predictive analytics, and personalized educational interventions [2]. These trends present a compelling opportunity to rethink career counselling using AI as both a delivery mechanism and a decision-support system.

In addition to empirical validation, the paper offers a theoretical analysis linking calibration regularization to statistical parity constraints, contributing to the growing field of fairness-aware biometric learning. Unlike earlier methods that rely heavily on balanced training data or post-hoc score adjustments, Kotwal and Marcel's model operates as an integral part of the training pipeline, making it deployable in real-world face authentication systems seeking regulatory and ethical compliance.

A key contribution of the work is its multidimensional assessment of biometric performance under constraints specific to mobile devices, including sensor variability, limited processing power, and environmental noise. The authors delve into innovations such as continuous authentication, multimodal fusion, and privacy-preserving biometric computation, particularly through on-device processing and template protection schemes.

Equally notable is their treatment of sociotechnical challenges: demographic bias, spoofing susceptibility, and lack of standardization across mobile operating systems. The paper highlights how adversarial attacks and deepfake technologies pose new threats to biometric robustness, necessitating liveness detection and explainability as core system features. Future directions proposed include decentralized biometric storage using blockchain and federated learning models.

4. Motivation and Need for the Study

Despite the proliferation of digital platforms in the educational sector, very few tools are designed to democratize access to career guidance. Existing systems are often urban-centric, available in English, and rely on internet infrastructure that is scarce in rural areas [3]. More importantly, these platforms operate as black-box models, offering recommendations without transparency in their logic or fairness in their outcomes. The absence of culturally responsive and aptitude-aware systems exacerbates the risk of misguided career paths, especially among socio-economically disadvantaged students. This lacuna motivated the formulation of a comprehensive, AI-driven framework aimed at making career counselling both accessible and interpretable.

5. Research Objectives

This study seeks to develop an integrative AI-driven framework that fulfils the following objectives:

- To design and implement aptitude-based models capable of identifying student strengths and weaknesses using psychometric and academic indicators.
- To deploy Explainable AI (XAI) mechanisms that allow stakeholders—students, parents, and educators to understand the rationale behind career recommendations.
- To enable multi-lingual interaction through Natural Language Processing (NLP) techniques tailored for Indian languages.
- To ensure the framework is scalable, cost-efficient, and suitable for deployment in low-resource educational environments [5]

6. Limitations

Although the proposed framework is designed to accommodate linguistic, socio-economic, and cognitive diversity, certain limitations persist. The quality of career recommendations is contingent upon the integrity of self-reported data, which may be subject to response bias. Additionally, while efforts have been made to ensure fairness and inclusivity, algorithmic predictions may still reflect embedded biases if training data is not sufficiently diverse. Finally, regional deployment may require customization to accommodate state-specific curriculum and vocational trends.

In summary, the data framework for this thesis integrates government repositories, open-access psychometric tools, global occupational databases, multilingual NLP corpora, and original field data. This hybrid approach ensures that the AI system is both contextually grounded and scalable for national deployment. The integrity, diversity, and ethical stewardship of this data ecosystem form the backbone of the proposed framework's reliability, accuracy, and inclusiveness.

7. AI Ethics and NLP

The integration of Artificial Intelligence (AI) into educational environments has accelerated over the past decade, with notable advances in adaptive learning systems, predictive analytics, and intelligent tutoring. However, the application of AI for personalized career counselling, particularly within linguistically and socio-economically diverse populations, remains underexplored. This research critically examines recent literature from 2021 to 2025 that intersects career guidance, AI ethics, educational data mining, psychometric modelling, and multilingual NLP systems. The objective is to identify conceptual and methodological gaps, culminating in the rationale for the proposed AI-driven framework.

The findings justify the need for integrative and inclusive AI frameworks that address secondary-level learners' needs through personalization, transparency, and socio-cognitive alignment principles that form the foundation of this thesis. Moreover, the study's attention to behavioural feedback loops provides actionable design implications. When applied to secondary education, such loops can be repurposed to track motivational dips or psychological strain during the career exploration process, enabling timely human intervention.

A core insight from the study is the paradox of personalization while AI promises learner-specific support, it often relies on data inputs that underrepresent marginalized or under-connected student populations, leading to biased outcomes or algorithmic misalignment. In the context of secondary school career counselling, this observation is especially pertinent. Systems designed to guide career pathways must be context-aware and representative, or risk reinforcing educational disparities through skewed recommendations.

8. AI tools for Cognitive and Emotional Development

Additionally, the study highlights a misalignment between AI developers and educators in pedagogical intent, with many tools being optimized for administrative efficiency rather than human-centric learning objectives. This disconnect suggests the necessity for participatory design approaches where educators, learners, and technologists collaboratively shape AI

AI tools when implemented without institutional accountability or educator oversight. Particularly in secondary education, where students are still in formative stages of cognitive and emotional development, unchecked AI interventions risk shaping learning outcomes and self-perceptions in potentially harmful ways. This is acutely relevant for AI-based career guidance systems, which must balance predictive accuracy with human-centric values such as autonomy, consent, and psychological safety.

9. Conclusion

The collective insights from the literature affirm the growing relevance of AI in career and educational guidance, but simultaneously expose a fundamental misalignment between technological innovation and contextual application in Indian secondary schools. These gaps establish the rationale for this research to develop an AI-driven, psychometrically integrated, ethically transparent, and linguistically inclusive career guidance framework that is specifically designed for the cognitive and socio-cultural profiles of Indian secondary school students.

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