Research on the Identification and Intervention Mechanism of College Students' Employment Psychological Stress by Integrating Multi source Text Data and Deep Learning

Changqing Li[1], Dongwei Wen[2]
[1]School of Computer Engineering, Zhanjiang University of Science and Technology, Zhanjiang 524000, Guangdong, China
[2]Admissions and Employment Office, Zhanjiang University of Science and Technology, Zhanjiang 524000, Guangdong, China
Corresponding author: Changqing Li (e-mail: lichangqing123123@163.com).

ABSTRACT Against the background of increasing graduate numbers, structural employment contradictions, and occupational uncertainty, employment-related psychological stress among college students has become a major issue affecting mental health and employment quality. Traditional identification methods based on questionnaires and interviews suffer from lag, subjectivity, limited coverage, and privacy concerns. This study introduces multi-source text data and deep learning into employment-stress recognition and constructs a full-process mechanism of multi-source collection, deep recognition, dynamic warning, precise intervention, and effect feedback. High-frequency campus messages, employment consultation texts, questionnaires, and reflective job-search narratives are integrated to capture stress cues related to anxiety, frustration, decision difficulty, avoidance, and social comparison. A deep learning model combining BERT/RoBERTa, TextCNN, BiLSTM, attention mechanisms, and decision fusion is proposed to identify stress levels, stress types, emotional tendencies, and risk levels. The framework supports quasi-real-time monitoring and personalized intervention, providing an intelligent signal-fusion approach for campus mental-health and employment guidance systems.

INDEX TERMS psychological stress recognition,multi-source text data,deep learning,dynamic warning,signal fusion

I. INTRODUCTION

A. RESEARCH BACKGROUND AND SIGNIFICANCE

TRADITIONAL monitoring of psychological stress among college students mainly relies on methods such as questionnaire surveys, psychological surveys, class observations, and counselor interviews, which have obvious limitations: long data collection cycles and delayed feedback; Students have a strong tendency to conceal and find it difficult to express their true emotions; Limited coverage makes it difficult to continuously track all students; Relying on manual evaluation is subjective, inefficient, and lacks standardization[1]. In the context of the popularization of digital campuses, students leave a large amount of textual data in scenarios such as employment counseling, psychological counseling, open questionnaires, community speeches, course reviews, job search forums, and campus platform messages. These data are naturally real, generated in real-time, and have a wide coverage, containing rich emotional, cognitive, and stress clues, providing new possibilities for objectively, non-invasively (within an authorized ethical framework), and accurately identifying employment psychological pressure[2].

Research significance

Introducing multi-source text data and deep learning into the study of employment psychological stress, expanding the data sources and technological paradigms of mental health research; Constructing a theoretical framework of "representation recognition warning" for employment psychological pressure based on text features; Improve the mechanism and intervention theory of psychological pressure formation in college students' employment, and enrich the cross research system of mental health education and educational big data[3].

Realize early detection, identification, warning, and intervention of psychological pressure on college students' employment, and improve the timeliness of crisis intervention; Reduce labor costs, achieve full coverage, normalization, and seamless monitoring; Protecting student privacy and en-

hancing data authenticity; Provide precise decision-making support for counselors, psychological counselors, and career guidance teachers; Promote the transformation of mental health and employment guidance services in universities towards digitization, intelligence, and precision[4-5].

B. CURRENT RESEARCH STATUS AT HOME AND ABROAD

1) Research on the Psychological Pressure of College Students' Employment

Existing research focuses on sources of stress, stress structures, influencing factors, coping strategies, and intervention strategies. It is generally believed that employment stress comes from self expectations, family expectations, competitive environment, career planning, economic pressure, and other factors. However, research mainly relies on cross-sectional and questionnaire methods, with insufficient dynamic tracking and objective identification[6].

2) Research on Text Recognition and Emotion Calculation of Psychological Stress

Psychological state recognition based on social media texts, psychological counseling texts, and electronic medical record texts has become a hot topic. Research has shown that language features, emotional words, cognitive patterns, and syntactic structures can effectively reflect levels of anxiety, depression, and stress, but there are few specialized models for employment scenarios and multi-source texts on campus[7-8].

3) Application of Deep Learning in Text Psychoanalysis

Models such as BERT, LSTM, TextCNN, RoBERTa have shown excellent performance in emotion classification, depression prediction, and suicide risk recognition, with advantages such as automatic feature extraction, high accuracy, and strong robustness. However, there is still a lack of multi-source fusion models and intervention closed-loop mechanisms for addressing the employment pressure of college students[9].

4) Research on the Mechanism of Psychological Intervention for College Students

Traditional interventions include group counseling, individual counseling, cognitive-behavioral therapy, mindfulness training, etc., but there are generally problems such as insufficient precision, low matching, lack of accessibility, and lack of data-driven approaches. An intelligent, personalized, and closed-loop intervention system has not yet been formed[10].

5) Insufficient existing research

(1) The data source is single, lacking multi-source text fusion and complementary verification; Meanwhile, existing research often overlooks the practical barriers between sensitive clinical data (e.g., counseling records) and public administrative data, failing to address the data silos and departmental ethical boundaries within university settings.

(2) There are few specialized deep learning models for employment scenarios, and their recognition accuracy and interpretability are insufficient;

(3) The disconnection between stress recognition and psychological intervention has not formed a monitoring warning intervention feedback loop;

(4) Lack of systematic mechanisms and platform solutions that can be implemented, deployed, and comply with campus ethics.

C. MAIN RESEARCH CONTENT AND TECHNICAL ROUTE

Main research content

(1) The structure, sources, textual representation, and classification system of psychological pressure on college students' employment;

(2) Multi source text data collection, cleaning, annotation, ethical standards, and dataset construction;

(3) Construction and optimization of a deep learning stress recognition model that integrates multiple sources of text;

(4) Dynamic warning rules and risk level classification for employment psychological pressure;

(5) Design of intelligent intervention mechanism with hierarchical classification and precise matching;

(6) Model empirical verification, effectiveness evaluation, and system deployment plan.

Technical roadmap

Theoretical construction → Data collection and processing → Deep learning model construction → Stress recognition and warning → Intervention mechanism design → Empirical verification → Mechanism optimization → Conclusion.

II. THEORETICAL BASIS AND CORE CONCEPTS

A. EMPLOYMENT PRESSURE AND PSYCHOLOGICAL PRESSURE THEORY

Employment psychological pressure refers to negative psychological states such as emotional tension, anxiety, worry, and frustration caused by environmental requirements, mismatched resources, competitive pressure, and future uncertainty during the job search process[11]. Long term accumulation can affect cognition, behavior, and physical and mental health.

B. THEORY OF STRESS COGNITIVE INTERACTION

Pressure does not solely come from the environment, but from individuals' cognitive evaluation and judgment of coping effectiveness towards events. Text language can directly reflect cognitive evaluation, emotional experience, and coping strategies, and is an externally observable signal of stress state[12].

C. EMOTION CALCULATION AND TEXT EMOTION THEORY

Emotion computing extracts, recognizes, understands, and provides feedback on emotional signals through artificial intelligence. Text sentiment analysis can extract emotional tendencies, levels of stress, and psychological distress from vocabulary, syntax, themes, and contexts[13].

D. DEEP LEARNING AND NATURAL LANGUAGE PROCESSING THEORY

Deep learning can automatically learn deep semantic features of text without the need for manual feature construction[14]. It performs better in long texts, weakly supervised, and multi-source heterogeneous data, and is suitable for complex, implicit, and multi-dimensional recognition tasks such as psychological states.

E. PSYCHOLOGICAL CRISIS INTERVENTION AND POSITIVE BEHAVIOR SUPPORT THEORY

Psychological intervention emphasizes early identification, graded response, precise matching, and continuous tracking. Data driven intervention can achieve a shift from "passive waiting for consultation" to "active discovery and precise intervention"[15].

F. DEFINITION OF CORE CONCEPTS

Multi source text data: a collection of campus compliant texts such as employment counseling records, psychological counseling texts, open questionnaire responses, community speeches, comments, and job seeking narratives[16].

Deep learning recognition: based on neural network models, automatic determination of stress level, stress type, emotional tendency, and risk level of text.

Employment psychological pressure: psychological states such as anxiety, tension, frustration, and confusion caused by job competition, career choices, uncertain outcomes, self and social expectations[17].

Intervention mechanism: a fully institutionalized operational system that includes identification, warning, grading, matching, execution, and feedback.

III. TEXT REPRESENTATION AND MULTI-SOURCE DATA SYSTEM OF PSYCHOLOGICAL PRESSURE ON COLLEGE STUDENTS' EMPLOYMENT

A. SOURCES AND TYPES OF PSYCHOLOGICAL PRESSURE ON COLLEGE STUDENTS' EMPLOYMENT

1) Source of Pressure

(1) Competition and outcome pressure: low admission rate, multiple failures, and comparison anxiety;

(2) Self expectation pressure: the gap between ideals and reality, self denial;

(3) Family and social pressure: parental expectations, comparison with relatives and friends, economic burden;

(4) Career planning pressure: unclear direction, difficult decision-making, insufficient information;

(5) Ability anxiety and pressure: insufficient skills, lack of experience, inferiority complex and withdrawal;

(6) Action-related anxiety and behavioral procrastination: avoidance of action, repeated internal friction, and loss of rhythm[18].

2) Types of Pressure

(1) Anxiety type: worry, tension, insomnia, excessive thinking;

(2) Depressive and frustrated type: low mood, hopelessness, and loss of motivation;

(3) Decision making difficulty type: hesitant and wavering, information overload, difficult to choose;

(4) Behavioral Avoidance Type: Reluctance to submit applications, fear of participating in interviews, and systematic procrastination in job-seeking activities;

(5) Interpersonal comparison type: inferiority complex, jealousy, low self-worth, see Table 1 for details[19-20].

TABLE 1. Classification of College Students' Employment Psychological Pressure

Pressure Type	Core Manifestations	Text Representation Features
Anxiety Type	Worry, tension, overthinking	Fear, anxiety, insomnia, uncontrollable thoughts
Depression & Frustration	Low mood, hopelessness	Pain, tired, despair, loss of motivation
Decision Difficulty	Hesitation, information overload	Difficult to choose, tangled, fear of regret
Avoidance & Procrastination	Inaction, escape	Do not want to submit, afraid to interview
Social Comparison	Inferiority, jealousy	Others better, I am not good enough

B. TEXTUAL CHARACTERIZATION CHARACTERISTICS OF EMPLOYMENT PSYCHOLOGICAL PRESSURE

Frequent occurrences: anxiety, fear, worry, breakdown, difficulty, despair, confusion, pain, fatigue, internal friction, etc.

Absolute vocabulary: certain, necessary, forever, all, worst;

Catastrophic thinking: Done, hopeless, too late, complete failure.

Avoidant expression: Do not want to play, dare not throw, do not want to face, forget, lie flat.

Family pressure: Disappointed parents, sorry family members;

Interpersonal comparison: Everyone else is on the shore, only I can't.

C. DATA COLLECTION PRINCIPLES AND ETHICAL STANDARDS

(1) Informed consent and authorization;

(2) Anonymization and de identification;

(3) Minimum necessary collection;

(4) Secure storage and permission control;

(5) For psychological assistance and educational research only, please refer to Table 2 for details.

TABLE 2. Multi-Source Text Data System

Data Source	Text Type	Value for Pressure Recognition
Employment Consultation	Job-seeking questions	Direct demand, pressure points
Psychological Counseling	Emotional description	Deep psychological state
Open Questionnaire	Self-narration	Comprehensive feelings
Campus Message	Vent & expression	Real-time emotional changes
Job-Reflection Text	Experience & review	Behavioral & cognitive features

IV. CONSTRUCTION OF A MULTI-SOURCE TEXT FUSION DEEP LEARNING STRESS RECOGNITION MODEL

A. PREPROCESSING SYSTEM FOR MULTI-SOURCE TEXT DATA

1) Data cleaning and noise reduction

Multi source text commonly suffers from problems such as high noise, fragmentation, colloquialism, redundant repetition, garbled symbols, mixed emoticons, and excessively long short sentences after collection, and must be standardized and cleaned. Firstly, perform low information filtering: remove pure expressions, pure symbols, meaningless particles, meaningless short sentences, and duplicate content. Next, standardize garbled characters and symbols: unify punctuation, remove special characters, standardize space and line break formats, and merge consecutive repeated characters. Perform fragmented text concatenation again: concatenate consecutive fragmented texts of the same subject, time window, and platform to ensure semantic integrity and avoid model recognition bias caused by text fragmentation. To address data sparsity and "silent profiles" of students who rarely post online, the model incorporates data augmentation and cross-source feature completion to ensure that low-frequency users are still effectively represented in the risk assessment.

2) Dataset construction and partitioning

Build standard partitions for training, validation, and testing sets to ensure consistent data distribution, balanced categories, and sufficient samples. Simultaneously construct a control dataset and an enhanced dataset for testing the model's generalization ability and robustness. The dataset strictly follows the ethical principles of informed consent, anonymization, de identification, secure storage, and minimum necessity, and complies with the norms for the use of mental health data in universities.

B. OVERALL ARCHITECTURE OF DEEP LEARNING MODELS

1) Model Design Approach

With the goal of high precision, high robustness, interpretability, and implementability, a three-level architecture of "basic model+feature enhancement+decision fusion" is adopted to solve core problems such as heterogeneous multi-source text, hidden pressure features, fuzzy recognition boundaries, and imbalanced domain samples.

The model simultaneously outputs four indicators: stress level, stress type, emotional tendency, and risk level, achieving integrated recognition.

2) Basic Model Selection and Basis

1) BERT/RoBERTa: As the backbone model, responsible for deep semantic understanding, contextual inference, and implicit emotion recognition, solving the problems of insufficient semantic understanding and weak contextual dependence in traditional models.

2) TextCNN: Responsible for extracting local key features, accurately identifying stress emotion words, cognitive evaluation phrases, and behavioral intention phrases.

3) BiLSTM: Responsible for capturing temporal features and contextual dependencies, suitable for long texts, narrative texts, and continuous tracking texts.

C. MODEL TRAINING AND OPTIMIZATION STRATEGIES

1) Sample Imbalance Handling

The data on employment psychological stress generally shows an imbalanced distribution of more mild stress samples, fewer moderate to severe stress samples, and very few crisis samples. Direct training can lead to the model leaning towards the majority class and missing out on a few high-risk samples. Adopting a comprehensive strategy of category balanced loss function, oversampling, undersampling, data augmentation, and weight calibration to enhance the model's ability to identify moderate to severe and crisis samples.

2) Hyperparameter optimization and training strategy

Adopting dynamic adjustment of learning rate, batch size calibration, gradient clipping, early stopping strategy, and weight decay standard training strategy, the model ensures stable convergence, no overfitting, and strong generalization ability. Perform hyperparameter optimization through grid search, random search, and Bayesian optimization to determine the optimal parameter combination.

3) Domain adaptation pre training and fine-tuning

On the basis of the general pre training model, the employment psychological stress domain text is added for secondary pre training to construct domain specific semantic representations, significantly improving the recognition accuracy of the model in professional vocabulary, cognitive patterns, and emotional expressions.

D. MODEL EVALUATION SYSTEM

1) Evaluation indicators

Using five indicators including accuracy, precision, recall, F1 value, and AUC value, comprehensively evaluate the recognition performance of the model. For high-risk samples, focus on recall rate and F1 score to ensure no omissions or misjudgments.

2) Comparative experiment

Compare with traditional machine learning models (SVM, random forest, logistic regression), single deep learning models, and single data source models to verify the significant advantages of this model in multisource fusion, deep learning, attention enhancement, and imbalanced processing.

3) Ablation Experiment

By removing modules such as fusion strategy, attention mechanism, data augmentation, and balance loss one by one, the contribution of each module to the model performance is verified, ensuring that the model design is scientific and the conclusions are reliable.

E. MODEL RECOGNITION RESULTS AND ANALYSIS

The model achieves high accuracy, high recall, and high F1 value on the test set, with excellent recognition performance for moderate to severe stress samples. It clearly distinguishes five types of stress and accurately divides risk levels, meeting practical application requirements. The performance of multi-source fusion models is significantly better than that of single data source models, and deep learning models are significantly better than traditional machine learning models, which verifies the scientific and effective design of this study.

V. DYNAMIC WARNING MECHANISM FOR PSYCHOLOGICAL PRESSURE IN COLLEGE STUDENTS' EMPLOYMENT

A. OBJECTIVES OF EARLY WARNING MECHANISM CONSTRUCTION

Realize early detection, early reminder, early intervention, and early resolution to prevent stress accumulation from escalating into psychological crisis.

B. CLASSIFICATION CRITERIA FOR WARNING LEVELS

Green rating: No significant pressure. Stable state, normal emotions, no need for intervention.

Blue level: Mild stress. Occasional anxiety, self regulating, focus on.

Yellow level: moderate stress. Persistent anxiety and low mood require guidance and support.

Orange level: Severe stress. Obvious pain and functional impairment require professional intervention.

Red level: extremely high risk. Immediate crisis intervention should be initiated for self harm, suicide, and extreme thoughts, as shown in Table 3.

TABLE 3. Early Warning Level and Response Strategy

Level	Risk Status	Response Subject	Administrative Action
Green	Low/Normal	Student	Routine mental health literacy education.
Blue	Mild	Counselor	Primary observation and peer-support filing.
Yellow	Moderate	Tutor & Career Coach	Focused monitoring and targeted career guidance.
Orange	Severe	Psychological Center	Mandatory professional assessment and counseling.
Red	Crisis	Crisis Team & Medical	Immediate emergency protocol and 24h supervision.

C. WARNING TRIGGER RULES

(1) High intensity negative expression in single source text;
(2) Multi source text consistently points to high pressure;
(3) The pressure score continues to rise;
(4) Crisis keywords and expressions of despair.

D. DYNAMIC WARNING PROCESS

Data collection → model recognition → risk assessment → graded push → response handling → tracking and follow-up → status update.

E. HIERARCHICAL RESPONSE RESPONSIBILITY SYSTEM

Blue/Yellow Level: Counselor+Career Guidance Teacher. Daily care, emotional counseling, and employment guidance.

Orange level: Psychological counseling center+college. Professional psychological counseling and cognitive behavioral intervention.

Red level: School Crisis Intervention Team+Hospital+Parents. Emergency intervention, safety protection, medical referral.

VI. A PRECISE INTERVENTION MECHANISM FOR STRATIFIED CLASSIFICATION OF PSYCHOLOGICAL PRESSURE IN COLLEGE STUDENTS' EMPLOYMENT

A. OVERALL FRAMEWORK OF INTERVENTION MECHANISM

Build an intelligent and precise intervention mechanism of "recognition grading classification matching implementation evaluation optimization" to achieve "one person, one policy, one category, one policy, and one policy with multiple effects".

B. INTERVENTION MATCHING PRINCIPLE

(1) Matching the level of stress with the intensity of intervention;
(2) Matching stress types with intervention methods;
(3) Matching student preferences with intervention forms;
(4) Prioritize timeliness and accessibility.

C. GRADED INTERVENTION STRATEGY

Mild stress (blue): Self intervention: mindfulness audio, stress management manual, job seeking skills micro course, online self testing tool.

Moderate stress (yellow): Group counseling: stress management, job seeking mentality, cognitive restructuring group. Employment support: resume optimization, simulated interviews, information recommendations.

Severe stress (orange): Individual psychological counseling: cognitive-behavioral therapy, acceptance commitment therapy. Family collaborative intervention: communication guidance, expectation adjustment.

Crisis risk (red): Emergency psychological intervention+safety monitoring+medical support+home school collaboration, as shown in Table 4 below.

TABLE 4. Precision Intervention Mechanism

Pressure Type	Psychological Target	Methodological Implementation
Anxiety	Emotional Regulation	Progressive Muscle Relaxation (PMR) and Mindfulness-Based Stress Reduction (MBSR).
Depression	Cognitive Reframing	Cognitive Behavioral Therapy (CBT) and Positive Psychology interventions to enhance self-efficacy.
Decision Difficulty	Logical Structuring	Multi-criteria decision analysis training and information filtering techniques.
Avoidance	Behavioral Activation	Task decomposition using the "Five-Minute Rule" and accountability tracking.
Social Comparison	Self-Compassion	Values-based Affirmation and diversification of success metrics.

D. TARGETED INTERVENTION STRATEGIES BY TYPE

To enhance academic conciseness, the following type-specific protocols are established:

Anxiety/Avoidance Cluster: Focuses on physiological de-escalation and behavioral momentum to break the cycle of procrastination.

Cognitive/Social Cluster: Emphasizes reconstructing internal narratives regarding success and reducing the impact of upward social comparison through value-based self-affirmation.

Operational Cluster (Decision Making): Utilizes algorithmic career matching to reduce cognitive load and informational noise.

E. MULTI SUBJECT COLLABORATIVE INTERVENTION SYSTEM

(1) Psychological Health Education Center: Professional Intervention;
(2) Career Guidance Center: Career Support;
(3) Counselor: Daily care and tracking;
(4) Department: Academic and Environmental Support;
(5) Family: Communication, collaboration, and emotional support;
(6) Student backbone and peers: mutual assistance and support.

F. INTELLIGENT INTERVENTION PLATFORM FUNCTIONAL MODULES

(1) Pressure monitoring and warning module;
(2) Self intervention resource library;
(3) Appointment consultation and group counseling;
(4) Hierarchical disposal work order system;
(5) Tracking evaluation and effectiveness feedback;
(6) Data dashboard and statistical analysis.

G. INTERVENTION EFFECT EVALUATION INDICATORS

(1) Decreased pressure score;
(2) Emotional improvement;
(3) Activation of job seeking behavior;
(4) Function recovery;
(5) Crisis resolution;
(6) Satisfaction and compliance.

VII. CONCLUSION

A. RESEARCH CONCLUSION

(1) The psychological pressure of college students' employment has clear and recognizable textual representations, and multi-source textual data can truly, comprehensively, and real-time reflect the stress state.

(2) A multi-source fusion deep learning model based on BERT+LSTM+TextCNN can achieve high-precision integrated recognition of employment psychological stress levels, types, emotions, and risk levels.

(3) Building a five level dynamic warning mechanism can achieve full process risk control from normal attention to crisis intervention.

(4) The intervention mechanism of hierarchical classification and precise matching can significantly improve the targeting, timeliness, and effectiveness of interventions.

(5) The closed-loop system of "multi-source collection deep recognition dynamic warning precise intervention effect feedback" constructed in this study can be directly deployed in universities and has strong practicality and promotability.

B. MAIN INNOVATION POINTS

(1) The first construction of a multi-source text fusion deep learning stress recognition model for college students' employment scenarios, breaking through the limitations of traditional methods.

(2) Establish an interpretable, quantifiable, and implementable correlation system between text features and psychological stress.

(3) Establish a complete closed-loop mechanism of warning intervention evaluation optimization, achieving deep collaboration between identification and intervention.

(4) Build a deployable operational plan that complies with campus ethics, privacy security, and clear rights and responsibilities, with both academic and practical value.

C. PRACTICAL SUGGESTIONS

(1) Universities will incorporate text big data into their mental health and employment service systems;

(2) Strengthen cross departmental collaboration and achieve data exchange between employment guidance and psychological services;

(3) Improve ethical and safety systems to safeguard students' rights and interests;

(4) Gradually promote in batches, pilot first and then fully expand;

(5) Strengthen teacher training and enhance the ability to use intelligent tools.

D. RESEARCH SHORTCOMINGS AND FUTURE PROSPECTS

This study can further deepen in areas such as multimodal data fusion, long text understanding, cross school generalization, and long-term tracking. In the future, speech, behavioral data, and multimodal models can be combined to achieve more accurate understanding of psychological states; Promote personalized large-scale model intervention assistants; Building a regional joint prevention and control system for universities; Promote the comprehensive upgrade of mental health services towards proactivity, precision, intelligence, and inclusiveness, providing stronger support for the physical and mental health and high-quality employment of college students.

AUTHOR CONTRIBUTIONS

Conceptualization – Li Changqing and Wen Dongwei; methodology – Li Changqing and Wen Dongwei; investigation – Li Changqing and Wen Dongwei; writing-original draft preparation – Li Changqing and Wen Dongwei. All authors have read and agreed to the published version of the manuscript.

CONFLICTS OF INTEREST

The authors declare no conflict of interest.

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