



UTTARAKHAND OPEN UNIVERSITY,
HALDWANI, NAINITAL

The report should be sent (in the sealed envelope) to the Exam Controller, Uttarakhand Open University,
Teen pani Bypass Road, Haldwani (Nainital) -263139.

DATE: 16/10/2023

UOU/Research/ Computer Science /2023/01

PROFORMA FOR THE WRITING Ph. D. THESIS REPORT

- 1- Name of the Candidate Ms. Shilpa Aneja , Registration No. 19199921".
- 2- Subject: Computer Science
- 3- Name of the Doctorate Degree: Ph. D.
- 4- Title of thesis : topic "Study and Development of an Expert System for Providing career Guidance: With Reference to Uttarakhand "
5. Name of the examiner with full postal address: *Prof. M.P. Thapliyal, Dept. of Computer Science & Engineering, H.N.B. Gharwal University, Srinagar, Uttarakhand .*

Note – Under the ordinance relating to Doctorate Degree a thesis shall comply with the following conditions and the examiners are requested that in case they approve of a thesis for the degree, is should be definitely mentioned in the report that the thesis complies with these requirements.

(a) It must be a piece of research work characterized either by the discovery of facts or by a fresh approach towards the interpretation of facts or theories. In either case it should evince the candidate's capacity for critical examination and sound judgment.

(b) It shall be satisfactory in point of language and presentation of subject matter. The examiners will also indicate whether the thesis is suitable for publication in its present form with or without amendments.


IMPORTANT

The Examiner is requested to recommend definitely weather.

- ☒ (a) The candidate is admitted to the degree.
Or
(b) ~~The candidate should improve and resubmit the thesis.~~
Or
(c) ~~The thesis should be rejected.~~

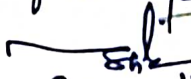
REPORT

Dated 13.03.2024


Dr. M.P. Thapliyal
Professor
Department of Computer Science & Engg.
(Signature of the Examiner, Gharwal University
(A Central University)
Srinagar (Gharwal) Uttarakhand

(If necessary blank sheets may be added to complete the report)

The Ph. D. Viva Voce of Ms. Shilpa Aneja was held on 13 March, 2023 at 3:00 PM via online mode. The candidate presented well entire research work conducted, articulating well all contributions made. All questions were answered correctly with proper scientific justification. On the basis of her performance she may be awarded Ph.D. degree.


(Prof. M.P. Thapliyal)
13.03.2024

PhD Thesis Evaluation Report

Name of the Research Scholar: Shilpa Gunwant Enrolment Number: 19199921

The thesis titled "Study and Development of Expert System for Career Guidance: with reference to Uttarakhand" demonstrates a comprehensive understanding of the subject matter and presents a significant advancement in the field of career counseling.

Shilpa Gunwant's doctoral thesis explores the creation of an expert system for career guidance, specifically tailored to the context of Uttarakhand. The study encompasses a thorough investigation into existing applications of Expert Systems (ES), aiming to develop a comprehensive and accessible solution for career selection.

Shilpa's research objectives were well-defined and successfully achieved. Through a meticulous survey of literature, she obtained relevant knowledge essential for career decision-making, identifying key factors influencing career choices. The development of a web-based application, utilizing modern technologies such as AngularJS, node.js, express.js, JSON rule engine, and MySQL, demonstrates her commitment to creating a user-friendly and powerful tool for students.

The findings of Shilpa's research highlight the efficacy of the rule-based expert system developed. By employing the forward chaining approach, the system effectively assists career advisers and secondary school graduates in making informed professional decisions. Notably, the system addresses the challenges faced by career counsellors, such as complex calculations, timely decision-making, and ensuring equal treatment of all students.


The methodology employed in the study, including system installation and analysis, is thoroughly documented, enhancing the reproducibility and reliability of the research outcomes. The evaluation of the system's effectiveness using statistical measures such as Spearman's rank correlation coefficient and coefficient of variance adds rigor to the study and validates the superiority of the developed approach.

The research outcomes demonstrate that the rule-based expert system outperforms traditional manual methods in guiding career selection. Shilpa's work offers valuable insights into the practical application of expert systems in career counselling, benefiting both students and professional counsellors. Moreover, the inclusion of publications in reputable journals indexed in the SCOPUS database underscores the scholarly significance of the research.

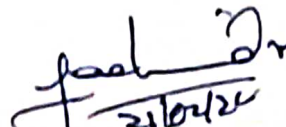
In conclusion, based on the evaluation of the research objectives and outcomes, it is recommended to award Shilpa Gunwant the Ph.D. degree for her thesis titled "Study and Development of Expert System for Career Guidance: with reference to Uttarakhand" with no changes. Shilpa's research exemplifies academic excellence and promises to make meaningful contributions to the field of career counselling.

Questions for Viva-Voce

1. Can you provide a brief overview of your research methodology and explain why you chose the specific approach?
2. How did you ensure the reliability and validity of your research findings?
3. What were the main challenges you encountered during the development of the expert system, and how did you overcome them?
4. How do you envision the practical application of your expert system in real-world career counseling scenarios, particularly in the context of Uttarakhand?
5. How would you address potential limitations or biases in the expert system's recommendations, particularly concerning individual differences among students?


[Dr. Mathura Prasad Thapliyal]

Professor, Computer Science & Engineering, Hemwati Nandan Bahuguna Garhwal Central University, Srinagar, Uttarakhand


21/02/24

21/02/24



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DATE: 16/10/2023

UOU/Research/ Computer Science /2023/01

PROFORMA FOR THE WRITING Ph. D. THESIS REPORT

- 1- Name of the Candidate Ms. Shilpa Aneja , Registration No. 19199921”.
- 2- Subject: Computer Science
- 3- Name of the Doctorate Degree: Ph. D.
- 4- Title of thesis : topic “Study and Development of an Expert System for Providing career Guidance: With Reference to Uttarakhand ”
5. Name of the examiner with full postal address : *Prof. Sandeep Singh, Dept. of Computer & Information Sciences, IGNOU, New Delhi.*

Note – Under the ordinance relating to Doctorate Degree a thesis shall comply with the following conditions and the examiners are requested that in case they approve of a thesis for the degree, is should be definitely mentioned in the report that the thesis complies with these requirements.

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Or
(b) The candidate should improve and resubmit the thesis.
Or
(c) The thesis should be rejected.

REPORT

Dated 20/11/23

(If necessary blank sheets may be added to complete the report)

*(Please find the attachment
of Evaluation Report.)*

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(Signature of the Examiner)

प्रो. संदीप सिंह रावत / Prof. Sandeep Singh Rawat
आचार्य / Professor
कम्प्यूटर एवं सूचना विज्ञान विद्यापीठ
School of Computer & Information Sciences
इ.गो.रा.मु. विश्वविद्यालय, मैदान गढ़ी, नई दिल्ली-110068
IGNOU, Maidan Garhi, New Delhi-110068

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Ph.D. Thesis Evaluation Report

Title: Study and Development of an Expert System for Providing Career Guidance:
With Reference to Uttarakhand

Candidate: Ms. Shilpa Aneja, Enrolment No. 19199921

Supervisor: Dr. Jeetendra Pande

Co-Supervisor: Dr. Raj Kishor Bisht

Examiner/Reviewer: Prof. Sandeep Singh Rawat, SOCIS, IGNOU, New Delhi.

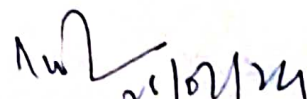
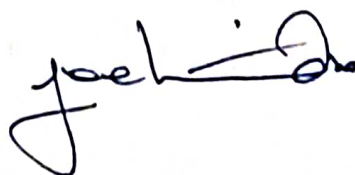
Ref.: UOU/Research/Computer Science/2023/01/309 dated: 16/10/2023

1. Introduction

The candidate has talked about the decision of career selection is influenced by factors such as academic performance, societal norms, financial considerations, and parental influence. This often leads to a mismatch between students' passions and their chosen careers, resulting in underutilization of their potential. The societal divide between those with opportunities and those struggling further exacerbates this issue, as some professions are highly respected while others are stigmatized. This biased career selection perpetuates the unequal growth of educational institutions, with some programs in high demand and others neglected. The consequences of this cycle include societal chaos and exploitation.

To address these challenges, fostering collaboration between parents and students in making career choices is essential. Parents should avoid pressuring their children into high-paying careers, while students should consider parental advice and experiences. Career selection expert systems have emerged as valuable tools to assist students in making informed decisions based on their strengths and weaknesses.

The thesis aims to develop a web-based career guidance expert system to help students make informed career choices, considering individual interests, capabilities, and personality traits. This system can play a crucial role in addressing career selection challenges, especially in regions like Uttarakhand, where unemployment and inaccessibility to expert advice are prevalent issues. The study's importance lies in providing students with accessible and effective career guidance, enabling them to make well-informed decisions about their future.



2. Research gaps, objectives and scope definition

The first 27 pages of the thesis were devoted to outlining the methodology, which included the rationale behind the selection of the topic, the objectives of the thesis, the most important questions, and the methodology itself, which referred to the question of the approaches that were utilized to approach the issue. It should be noted that methodology is a research gaps and objectives are the critical component of the Ph.D. thesis and frequently decides the success or failure of the whole Ph.D. project.

Candidate has identified the following research gaps:

- Limited cultural and social context integration: Many career guidance-based Expert Systems (ES) lack consideration for cultural and social diversity, often being designed based on Western norms and values, which may not suit individuals from different cultural backgrounds.
- Inadequate adaptability to changing career choices: Existing ES typically provide one-time recommendations based on an individual's abilities, interests, and preferences, without accounting for the dynamic nature of career choices, where individuals may change interests or face unexpected challenges.
- Reliance on self-reported data: Many career guidance ES rely on individual self-reported data, which may be biased or incomplete. There is a need to incorporate other data sources, such as social media activity, educational records, and work experience, for a more comprehensive assessment of career potential.

The research objectives of the thesis are the following:

- Develop a user-friendly web-based career guidance Expert System (ES) to assist students in choosing suitable career paths.
- Conduct a literature survey to understand the various applications of ES in different fields.
- Gather relevant knowledge required for career selection and express it clearly within the ES.
- Identify the most important factors influencing career decisions and incorporate them into the system.
- Test the ES with sample cases under expert supervision to ensure its effectiveness in providing valuable guidance to students.

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3. Structure of the thesis, results, implications, and methodology

Regarding the structure of the thesis, it is duly recognized that the candidate possesses the right and responsibility to choose a format that, in her judgment, effectively addresses the posed research issue. The methods employed in the thesis are generally appropriate and well-justified. Throughout the thesis, the candidate demonstrates a sufficient ability to select justified methods that align with the research goals and successfully apply them. The candidate identifies five research problems, conducting a preliminary analysis that focuses on influential parameters affecting students' career selection, with an emphasis on the role of parental and teacher mentoring. The introduction of AI-based Educational Systems (ES) for career guidance, utilizing machine learning to consider various factors, is presented. The research methodology adopts a quantitative approach, utilizing a questionnaire sent to individuals across diverse fields. Results highlight educational qualifications, parents' occupations, and the significance of parental and teacher guidance.

The thesis centers on the classifier model of the Expert System (ES) for career suggestion, addressing aspects such as model development and a comparison of machine learning algorithms. The framework encompasses input, knowledge base, inference engine, and output components. Data preprocessing is executed using Scikit-learn, and various machine learning techniques, including FURIA, JRip, PART, ID3, J48, IB1, and PRISM, are employed to validate the results obtained from the ES. The evaluation metrics, including accuracy, Kappa statistics, mean absolute error (MAE), root mean squared error (RMSE), root relative squared error (RRSE), and relative absolute error (RAE), are thoroughly discussed. The ES's impressive accuracy rate (93%) in comparison to counselor results substantiates its efficacy, potentially eliminating the need for extensive counseling. The Rule-Based Expert System Approach (RBESA) is evaluated based on specific criteria, considering user opinions on usability, interface friendliness, accessibility, security, reliability, timeliness, and overall performance. The results convincingly demonstrate the ES's effectiveness in providing comprehensive career guidance.

A notable revelation from the research is that approximately 50% of respondents report insufficient parental guidance, while 63% express a lack of satisfactory teacher guidance. These findings underscore the critical need for improved career guidance sessions at both the school and college levels and addresses the challenge of limited government-appointed counselors in Uttarakhand, emphasizing the crucial career decisions students face after secondary school. The study's outcomes affirm the rule-based expert system as a superior method for swift and unbiased career guidance, particularly beneficial for students in remote areas lacking professional assistance.

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4. Presentation and language, command of sources

In general, the thesis's appearance is adequate. There are no such grammatical or typographical problems in the thesis that would significantly impede reading. The references to relevant literature are adequate and reflect the current state of knowledge. Shilpa Aneja showed adequate knowledge of the pertinent literature and other relevant sources, and she applied herself in a way that was consistent with the applicable rules of the School of Computer Science and Information Technology, Uttarakhand Open University.

5. Overall outcome

The present PhD thesis's structure and independent writing may be recognized as the candidate's recognizable contributions. Despite some issues, I applaud the candidate's efforts and clearly discernible engagement, and I find that the thesis submitted meets the general requirements for academic works of this type, as stipulated by the relevant provisions of Uttarakhand Open University, Haldwani.

Given this, I think it's fair to say that the thesis is a well-written report and that the research done is worthy of praise. After careful consideration, I have decided to recommend that Shilpa Aneja's thesis titled "Study and Development of an Expert System for Providing Career Guidance: With Reference to Uttarakhand" be accepted as written and that she may be granted the degree of Doctor of Philosophy in School of Computer Science and Information Technology, Uttarakhand Open University, Haldwani after successful defense.

Signature of the Examiner/Reviewer

Date:

20/10/23

प्रो. संदीप सिंह रावत / Prof. Sandeep Singh Rawat
आचार्य / Professor

कम्प्यूटर एवं सूचना विज्ञान विभाग
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