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Description automatically generated

Final Project

University Research Paper Management System

[CSCI-6622-01](https://canvas.newhaven.edu/calendar?event_id=222371&include_contexts=course_33494) [Database Systems](https://canvas.newhaven.edu/courses/33494)

SPRING 2025

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# Introduction

* Project Overview:  
  The **University Research Paper Management System** (URPMS) is designed to streamline the management of academic papers, researchers, conferences, and citations in academic institutions. The system enables the tracking of academic publications, the researchers behind them, the conferences where papers are presented, and the citations they generate.

This project aims to provide a well-structured, easily accessible database system to store and retrieve academic paper data. The system will facilitate efficient reporting, searching, and managing research-related data for academic institutions, particularly universities and research organizations.

* Scope:  
  The system will focus on **Researcher**, **Paper**, **Conference**, and **Citation** entities. It will include key functionalities like querying paper details, tracking citations, and associating papers with conferences.

# Entity-Relationship (ER) Diagram

The **ER Diagram** represents the core entities and their relationships.

## Entities:

* + **Researcher**
  + **Paper**
  + **Conference**
  + **Citation**
  + **PaperConference** (Mapping table for many-to-many relationship)

## Relationships:

* + **Researcher** writes **Paper** (One-to-Many).
  + **Paper** is presented at **Conference** (Many-to-Many).
  + **Paper** cites **Citation** (One-to-Many).

## ER DIAGRAM

A diagram of a computer

AI-generated content may be incorrect.

## Database Schema Design from ER Model

* **Step 1: Identify Entities and Relationships**  
  The entities identified are **Researcher**, **Paper**, **Conference**, and **Citation**, each with relevant attributes. The relationships between these entities, including one-to-many and many-to-many types, were also defined.
* **Step 2: Define Attributes and Keys**  
  Each entity was assigned attributes (e.g., **Researcher** has ResearcherID, Name, Email) and keys (Primary Keys, Foreign Keys) to uniquely identify and establish relationships.
  + **Primary Keys**: ResearcherID, PaperID, ConferenceID, CitationID.
  + **Foreign Keys**: ResearcherID in **Paper**, CitingPaperID and CitedPaperID in **Citation**, PaperID and ConferenceID in **PaperConference**.
* **Step 3: Normalize Data**  
  The schema was normalized to ensure efficiency and minimize redundancy. Each table is normalized to the **Third Normal Form (3NF)**, ensuring that attributes are atomic and non-redundant.
* **Step 4: Implement Foreign Keys and Constraints**  
  Constraints like **NOT NULL** were added to mandatory fields. Foreign keys were established to enforce referential integrity between related tables.
* **Step 5: Create Triggers and Views**  
  Triggers were implemented to enforce business rules like **validating email addresses**, **checking paper abstract lengths**, and **preventing self-citations**.  
  Views were created to facilitate easy retrieval of common data, such as papers by a researcher and citation counts.

# Data Source

* Source of Data:  
  Data for this system will be sourced from publicly available academic databases like **Google Scholar**, **IEEE**, and **ResearchGate**, which provide metadata on research papers, authors, and academic conferences. Additionally, **synthetic data** will be generated to simulate real-world academic publishing scenarios.
* Data Population:  
  Data will be inserted into the database using **CSV files** containing details of **Researchers**, **Papers**, and **Conferences**. The system will also allow for the manual entry of citation data. Used Python code to populate:

**import feedparser**

**import csv**

**feed = feedparser.parse('http://export.arxiv.org/api/query?search\_query=cat:cs.AI&start=0&max\_results=50')**

**with open('researchers.csv', 'w', newline='') as rfile, open('papers.csv', 'w', newline='') as pfile:**

**rwriter = csv.writer(rfile)**

**pwriter = csv.writer(pfile)**

**rwriter.writerow(['ResearcherID', 'Name', 'Email', 'Affiliation', 'Role'])**

**pwriter.writerow(['PaperID', 'Title', 'Abstract', 'SubmissionDate', 'ResearcherID'])**

**researcher\_map = {}**

**rid = 1**

**pid = 1000**

**for entry in feed.entries:**

**name = entry.authors[0].name**

**if name not in researcher\_map:**

**researcher\_map[name] = rid**

**rwriter.writerow([rid, name, f'email{rid}@univ.edu', 'CS Dept', 'Professor'])**

**rid += 1**

**author\_id = researcher\_map[name]**

**pwriter.writerow([pid, entry.title[:100], entry.summary[:200], entry.published[:10], author\_id])**

**pid += 1**

# Tables:

## Researcher:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 1 | M. L. Ginsberg | email1@univ.edu | CS Dept | Professor |
| 2 | M. P. Wellman | email2@univ.edu | CS Dept | Professor |
| 3 | I. P. Gent | email3@univ.edu | CS Dept | Professor |
| 4 | F. Bergadano | email4@univ.edu | CS Dept | Professor |
| 5 | J. C. Schlimmer | email5@univ.edu | CS Dept | Professor |
| 6 | M. Buchheit | email6@univ.edu | CS Dept | Professor |
| 7 | N. Nilsson | email7@univ.edu | CS Dept | Professor |
| 8 | C. X. Ling | email8@univ.edu | CS Dept | Professor |
| 9 | D. J. Cook | email9@univ.edu | CS Dept | Professor |
| 10 | M. Koppel | email10@univ.edu | CS Dept | Professor |
| 11 | P. M. Murphy | email11@univ.edu | CS Dept | Professor |
| 12 | A. Borgida | email12@univ.edu | CS Dept | Professor |
| 13 | R. Sebastiani | email13@univ.edu | CS Dept | Professor |
| 14 | A. J. Grove | email14@univ.edu | CS Dept | Professor |
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| 17 | S. Safra | email17@univ.edu | CS Dept | Professor |
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| 21 | T. G. Dietterich | email21@univ.edu | CS Dept | Professor |
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| 23 | P. Cichosz | email23@univ.edu | CS Dept | Professor |
| 24 | P. D. Turney | email24@univ.edu | CS Dept | Professor |
| 25 | S. K. Donoho | email25@univ.edu | CS Dept | Professor |
| 26 | P. David | email26@univ.edu | CS Dept | Professor |
| 27 | A. Schaerf | email27@univ.edu | CS Dept | Professor |
| 28 | S. J. Russell | email28@univ.edu | CS Dept | Professor |
| 29 | W. W. Cohen | email29@univ.edu | CS Dept | Professor |
| 30 | M. Veloso | email30@univ.edu | CS Dept | Professor |
| 31 | R. J. Mooney | email31@univ.edu | CS Dept | Professor |
| 32 | R. Bergmann | email32@univ.edu | CS Dept | Professor |
| 33 | Q. Zhao | email33@univ.edu | CS Dept | Professor |
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| 35 | Y. Bengio | email35@univ.edu | CS Dept | Professor |
| 36 | G. Pinkas | email36@univ.edu | CS Dept | Professor |
| 37 | K. Woods | email37@univ.edu | CS Dept | Professor |
| 38 | S. B. Huffman | email38@univ.edu | CS Dept | Professor |
| 39 | G. I. Webb | email39@univ.edu | CS Dept | Professor |
| 40 | A. Broggi | email40@univ.edu | CS Dept | Professor |
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| 42 | D. Heckerman | email42@univ.edu | CS Dept | Professor |
| 43 | R. Khardon | email43@univ.edu | CS Dept | Professor |
| 44 | M. Buro | email44@univ.edu | CS Dept | Professor |
| 45 | S. M. Weiss | email45@univ.edu | CS Dept | Professor |
| 46 | P. vanBeek | email46@univ.edu | CS Dept | Professor |
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| 49 | T. Hogg | email49@univ.edu | CS Dept | Professor |
| 50 | Samplestud1 | emailsamp1@univ.edu | CS Dept | Student |
| 51 | Samplestud2 | emailsamp2@univ.edu | CS Dept | Student |

## Paper:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 1000 | Dynamic Backtracking | Because of their occasional need to return to shallow points in a search tree, existing backtracking methods can sometimes erase meaningful progress toward solving a search problem. In this paper, we | 1993-08-01 | 1 |
| 1001 | A Market-Oriented Programming Environment and its Application to   Distributed Multicommodity Flow P | Market price systems constitute a well-understood class of mechanisms that under certain conditions provide effective decentralization of decision making with minimal communication overhead. In a mark | 1993-08-01 | 2 |
| 1002 | An Empirical Analysis of Search in GSAT | We describe an extensive study of search in GSAT, an approximation procedure for propositional satisfiability. GSAT performs greedy hill-climbing on the number of satisfied clauses in a truth assignme | 1993-09-01 | 3 |
| 1003 | The Difficulties of Learning Logic Programs with Cut | As real logic programmers normally use cut (!), an effective learning procedure for logic programs should be able to deal with it. Because the cut predicate has only a procedural meaning, clauses cont | 1993-11-01 | 4 |
| 1004 | Software Agents: Completing Patterns and Constructing User Interfaces | To support the goal of allowing users to record and retrieve information, this paper describes an interactive note-taking system for pen-based computers with two distinctive features. First, it active | 1993-11-01 | 5 |
| 1005 | Decidable Reasoning in Terminological Knowledge Representation Systems | Terminological knowledge representation systems (TKRSs) are tools for designing and using knowledge bases that make use of terminological languages (or concept languages). We analyze from a theoretica | 1993-12-01 | 6 |
| 1006 | Teleo-Reactive Programs for Agent Control | A formalism is presented for computing and organizing actions for autonomous agents in dynamic environments. We introduce the notion of teleo-reactive (T-R) programs whose execution entails the constr | 1994-01-01 | 7 |
| 1007 | Learning the Past Tense of English Verbs: The Symbolic Pattern   Associator vs. Connectionist Models | Learning the past tense of English verbs - a seemingly minor aspect of language acquisition - has generated heated debates since 1986, and has become a landmark task for testing the adequacy of cognit | 1994-02-01 | 8 |
| 1008 | Substructure Discovery Using Minimum Description Length and Background   Knowledge | The ability to identify interesting and repetitive substructures is an essential component to discovering knowledge in structural data. We describe a new version of our SUBDUE substructure discovery s | 1994-02-01 | 9 |
| 1009 | Bias-Driven Revision of Logical Domain Theories | The theory revision problem is the problem of how best to go about revising a deficient domain theory using information contained in examples that expose inaccuracies. In this paper we present our app | 1994-02-01 | 10 |
| 1010 | Exploring the Decision Forest: An Empirical Investigation of Occam's   Razor in Decision Tree Induct | We report on a series of experiments in which all decision trees consistent with the training data are constructed. These experiments were run to gain an understanding of the properties of the set of | 1994-03-01 | 11 |
| 1011 | A Semantics and Complete Algorithm for Subsumption in the CLASSIC   Description Logic | This paper analyzes the correctness of the subsumption algorithm used in CLASSIC, a description logic-based knowledge representation system that is being used in practical applications. In order to de | 1994-06-01 | 12 |
| 1012 | Applying GSAT to Non-Clausal Formulas | In this paper we describe how to modify GSAT so that it can be applied to non-clausal formulas. The idea is to use a particular ``score'' function which gives the number of clauses of the CNF conversi | 1994-06-01 | 13 |
| 1013 | Random Worlds and Maximum Entropy | Given a knowledge base KB containing first-order and statistical facts, we consider a principled method, called the random-worlds method, for computing a degree of belief that some formula Phi holds g | 1994-08-01 | 14 |
| 1014 | Pattern Matching and Discourse Processing in Information Extraction from   Japanese Text | Information extraction is the task of automatically picking up information of interest from an unconstrained text. Information of interest is usually extracted in two steps. First, sentence level proc | 1994-08-01 | 15 |
| 1015 | A System for Induction of Oblique Decision Trees | This article describes a new system for induction of oblique decision trees. This system, OC1, combines deterministic hill-climbing with two forms of randomization to find a good oblique split (in the | 1994-08-01 | 16 |
| 1016 | On Planning while Learning | This paper introduces a framework for Planning while Learning where an agent is given a goal to achieve in an environment whose behavior is only partially known to the agent. We discuss the tractabili | 1994-09-01 | 17 |
| 1017 | Wrap-Up: a Trainable Discourse Module for Information Extraction | The vast amounts of on-line text now available have led to renewed interest in information extraction (IE) systems that analyze unrestricted text, producing a structured representation of selected inf | 1994-12-01 | 18 |
| 1018 | Operations for Learning with Graphical Models | This paper is a multidisciplinary review of empirical, statistical learning from a graphical model perspective. Well-known examples of graphical models include Bayesian networks, directed graphs repre | 1994-12-01 | 19 |
| 1019 | Total-Order and Partial-Order Planning: A Comparative Analysis | For many years, the intuitions underlying partial-order planning were largely taken for granted. Only in the past few years has there been renewed interest in the fundamental principles underlying thi | 1994-12-01 | 20 |
| 1020 | Solving Multiclass Learning Problems via Error-Correcting Output Codes | Multiclass learning problems involve finding a definition for an unknown function f(x) whose range is a discrete set containing k &gt 2 values (i.e., k ``classes''). The definition is acquired by stud | 1995-01-01 | 21 |
| 1021 | A Domain-Independent Algorithm for Plan Adaptation | The paradigms of transformational planning, case-based planning, and plan debugging all involve a process known as plan adaptation - modifying or repairing an old plan so it solves a new problem. In t | 1995-01-01 | 22 |
| 1022 | Truncating Temporal Differences: On the Efficient Implementation of   TD(lambda) for Reinforcement L | Temporal difference (TD) methods constitute a class of methods for learning predictions in multi-step prediction problems, parameterized by a recency factor lambda. Currently the most important applic | 1995-01-01 | 23 |
| 1023 | Cost-Sensitive Classification: Empirical Evaluation of a Hybrid Genetic   Decision Tree Induction Al | This paper introduces ICET, a new algorithm for cost-sensitive classification. ICET uses a genetic algorithm to evolve a population of biases for a decision tree induction algorithm. The fitness funct | 1995-03-01 | 24 |
| 1024 | Rerepresenting and Restructuring Domain Theories: A Constructive   Induction Approach | Theory revision integrates inductive learning and background knowledge by combining training examples with a coarse domain theory to produce a more accurate theory. There are two challenges that theor | 1995-04-01 | 25 |
| 1025 | Using Pivot Consistency to Decompose and Solve Functional CSPs | Many studies have been carried out in order to increase the search efficiency of constraint satisfaction problems; among them, some make use of structural properties of the constraint network; others | 1995-05-01 | 26 |
| 1026 | Adaptive Load Balancing: A Study in Multi-Agent Learning | We study the process of multi-agent reinforcement learning in the context of load balancing in a distributed system, without use of either central coordination or explicit communication. We first defi | 1995-05-01 | 27 |
| 1027 | Provably Bounded-Optimal Agents | Since its inception, artificial intelligence has relied upon a theoretical foundation centered around perfect rationality as the desired property of intelligent systems. We argue, as others have done, | 1995-05-01 | 28 |
| 1028 | Pac-Learning Recursive Logic Programs: Efficient Algorithms | We present algorithms that learn certain classes of function-free recursive logic programs in polynomial time from equivalence queries. In particular, we show that a single k-ary recursive constant-de | 1995-05-01 | 29 |
| 1029 | Pac-learning Recursive Logic Programs: Negative Results | In a companion paper it was shown that the class of constant-depth determinate k-ary recursive clauses is efficiently learnable. In this paper we present negative results showing that any natural gene | 1995-05-01 | 29 |
| 1030 | FLECS: Planning with a Flexible Commitment Strategy | There has been evidence that least-commitment planners can efficiently handle planning problems that involve difficult goal interactions. This evidence has led to the common belief that delayed-commit | 1995-06-01 | 30 |
| 1031 | Induction of First-Order Decision Lists: Results on Learning the Past   Tense of English Verbs | This paper presents a method for inducing logic programs from examples that learns a new class of concepts called first-order decision lists, defined as ordered lists of clauses each ending in a cut. | 1995-06-01 | 31 |
| 1032 | Building and Refining Abstract Planning Cases by Change of   Representation Language | ion is one of the most promising approaches to improve the performance of problem solvers. In several domains abstraction by dropping sentences of a domain description -- as used in most hierarchical | 1995-07-01 | 32 |
| 1033 | Using Qualitative Hypotheses to Identify Inaccurate Data | Identifying inaccurate data has long been regarded as a significant and difficult problem in AI. In this paper, we present a new method for identifying inaccurate data on the basis of qualitative corr | 1995-08-01 | 33 |
| 1034 | An Integrated Framework for Learning and Reasoning | Learning and reasoning are both aspects of what is considered to be intelligence. Their studies within AI have been separated historically, learning being the topic of machine learning and neural netw | 1995-08-01 | 34 |
| 1035 | Diffusion of Context and Credit Information in Markovian Models | This paper studies the problem of ergodicity of transition probability matrices in Markovian models, such as hidden Markov models (HMMs), and how it makes very difficult the task of learning to repres | 1995-10-01 | 35 |
| 1036 | Improving Connectionist Energy Minimization | Symmetric networks designed for energy minimization such as Boltzman machines and Hopfield nets are frequently investigated for use in optimization, constraint satisfaction and approximation of NP-har | 1995-10-01 | 36 |
| 1037 | Learning Membership Functions in a Function-Based Object Recognition   System | Functionality-based recognition systems recognize objects at the category level by reasoning about how well the objects support the expected function. Such systems naturally associate a ``measure of g | 1995-10-01 | 37 |
| 1038 | Flexibly Instructable Agents | This paper presents an approach to learning from situated, interactive tutorial instruction within an ongoing agent. Tutorial instruction is a flexible (and thus powerful) paradigm for teaching tasks | 1995-11-01 | 38 |
| 1039 | OPUS: An Efficient Admissible Algorithm for Unordered Search | OPUS is a branch and bound search algorithm that enables efficient admissible search through spaces for which the order of search operator application is not significant. The algorithm's search effici | 1995-12-01 | 39 |
| 1040 | Vision-Based Road Detection in Automotive Systems: A Real-Time   Expectation-Driven Approach | The main aim of this work is the development of a vision-based road detection system fast enough to cope with the difficult real-time constraints imposed by moving vehicle applications. The hardware p | 1995-12-01 | 40 |
| 1041 | Generalization of Clauses under Implication | In the area of inductive learning, generalization is a main operation, and the usual definition of induction is based on logical implication. Recently there has been a rising interest in clausal repre | 1995-12-01 | 41 |
| 1042 | Decision-Theoretic Foundations for Causal Reasoning | We present a definition of cause and effect in terms of decision-theoretic primitives and thereby provide a principled foundation for causal reasoning. Our definition departs from the traditional view | 1995-12-01 | 42 |
| 1043 | Translating between Horn Representations and their Characteristic Models | Characteristic models are an alternative, model based, representation for Horn expressions. It has been shown that these two representations are incomparable and each has its advantages over the other | 1995-12-01 | 43 |
| 1044 | Statistical Feature Combination for the Evaluation of Game Positions | This article describes an application of three well-known statistical methods in the field of game-tree search: using a large number of classified Othello positions, feature weights for evaluation fun | 1995-12-01 | 44 |
| 1045 | Rule-based Machine Learning Methods for Functional Prediction | We describe a machine learning method for predicting the value of a real-valued function, given the values of multiple input variables. The method induces solutions from samples in the form of ordered | 1995-12-01 | 45 |
| 1046 | The Design and Experimental Analysis of Algorithms for Temporal   Reasoning | Many applications -- from planning and scheduling to problems in molecular biology -- rely heavily on a temporal reasoning component. In this paper, we discuss the design and empirical analysis of alg | 1996-01-01 | 46 |
| 1047 | Well-Founded Semantics for Extended Logic Programs with Dynamic   Preferences | The paper describes an extension of well-founded semantics for logic programs with two types of negation. In this extension information about preferences between rules can be expressed in the logical | 1996-02-01 | 47 |
| 1048 | Logarithmic-Time Updates and Queries in Probabilistic Networks | Traditional databases commonly support efficient query and update procedures that operate in time which is sublinear in the size of the database. Our goal in this paper is to take a first step toward | 1996-02-01 | 48 |
| 1049 | Quantum Computing and Phase Transitions in Combinatorial Search | We introduce an algorithm for combinatorial search on quantum computers that is capable of significantly concentrating amplitude into solutions for some NP search problems, on average. This is done by | 1996-03-01 | 49 |

## Conference:

|  |  |  |  |
| --- | --- | --- | --- |
| 1 | IEEE International Conference on Cybersecurity | New York, USA | 2025-03-15 |
| 2 | International Blockchain Conference | London, UK | 2025-06-01 |
| 3 | Global AI and Privacy Summit | San Francisco, USA | 2025-07-10 |
| 4 | Quantum Cryptography Conference | Tokyo, Japan | 2025-09-20 |

## Citation:

|  |  |  |  |
| --- | --- | --- | --- |
| 1 | 1000 | 1001 | 1993-08-15 |
| 2 | 1002 | 1003 | 1993-09-10 |
| 3 | 1004 | 1000 | 1993-11-05 |
| 4 | 1002 | 1001 | 1993-12-01 |

## PaperConference:

|  |  |
| --- | --- |
| 1000 | 1 |
| 1004 | 1 |
| 1001 | 2 |
| 1002 | 3 |
| 1003 | 4 |

SQL File 1: DDL and Data Insertion  
The first SQL file includes the **Data Definition Language (DDL)** commands to create tables and constraints, along with triggers for data integrity. It also contains the **INSERT** commands to populate the database with sample data.

* **Tables Created**:
  + **Researcher**: Contains fields for storing researcher details.
  + **Paper**: Stores information about papers, with a foreign key linking to **Researcher**.
  + **Conference**: Stores information about conferences.
  + **Citation**: Contains data about paper citations, including links to citing and cited papers.
  + **PaperConference**: A junction table mapping many-to-many relationships between **Paper** and **Conference**.
* **Triggers**:
  + trg\_check\_email: Ensures email format validation.
  + trg\_check\_abstract: Ensures abstract length is not too short.
  + trg\_no\_self\_citation: Prevents papers from citing themselves.
* **Views**:
  + View\_PapersByResearcher: Lists papers along with their researchers.
  + View\_ConferencePapers: Lists papers presented at conferences.
  + View\_CitationCount: Counts citations for each paper.

SQL File 2: SELECT Queries  
The second SQL file contains **SELECT** queries to retrieve and analyze the data according to the following requirements:

* **Basic Selects**:
  + Retrieve all papers, ordered by submission date, and filter by conditions such as roles and affiliations.
* **Aggregate Functions**:
  + Count total papers, find the max and min PaperID, and calculate citation counts.
* **Joins**:
  + Inner join between **Researcher** and **Paper**, left join to include researchers with no papers, and self-join to link citing and cited papers.
* **Group By**:
  + Group researchers by role and count them, group by affiliation and count researchers in each department, with a HAVING clause to filter departments with more than one researcher.

Conclusion  
The **University Research Paper Management System** provides an organized and efficient way to manage academic research papers, including their citations and conferences. The system ensures data integrity through triggers and foreign keys, while also allowing for easy querying and reporting through views. The project successfully meets all requirements, including the creation of tables, triggers, views, and sample data insertion.