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ORIGINAL RESEARCH ARTICLE

Comparison of novel character relationship network mining and drama character relationship shaping algorithms

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ABSTRACT

This study embarks on an interdisciplinary journey to analyze and compare Character Relationships (CR) in two diverse storytelling mediums – the classic novel "Emma" by Jane Austen and the popular TV series "Friends". Leveraging a blend of Natural Language Processing (NLP) and advanced video analysis tools, this research "sheds light on" the intricate network of CR within these narratives. This study scientifically analyzes these relationships' complete method, creation, and impact using sentiment analysis, object identification, and story coherence algorithms. Qualitative and quantitative metrics such as precision, recall, F-score, and accuracy assist in explaining character updates. The content and TV exhibit distinct storytelling modes, and this study demonstrates that algorithmic analysis of stories is practical. The findings of this study request to contribute to online studies by focusing on understanding character networks and their vital role in TV storytelling.

Keywords: novel character relationship; NLP; machine learning; sentiment analysis; network mining; precision; recall; F-score; accuracy

1. Introduction

The analysis of Character Relationships (CR) in many different types of narrative storytelling, such as literature and TV shows, has been a subject for research in the realms of literary research and media arts for an extensive period of time. The intricate dynamics of CR contribute to the basis of storytelling mediums, which, in response, impact the level of participation of the viewers and the long-term impact of the story's progression[1]. Novel strategies for understanding these relationships have formed as part of the creation of internet-based arts and computational language analysis. These methodologies have delivered novel insights into the development and creation of psychological networks. In this media sector, one of the most significant challenges is the broad range of channels of operation and the unique visual storytelling mediums each media provides. For the objective of expressing relationships, creative works such as fiction frequently rely predominantly on narrative language and personal stories, while TV performances make use of visual hints, debate, and indirect communication[2]. The complicated nature of a comparative study analysis results from the reality that researching these types of CE requires distinct scientific methodologies. In addition, the fact that CR is understood emotionally is an essential challenge for creating accurate analytical models.

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Text-based study for novels and poetry and screenplay and analysis of scenes for movies and TV are the most important fields of interest for the frameworks that are currently present[3]. Text study methods such as Stanford Natural Language Processing (NLP) and SpaCy have proved valuable; at this point, they frequently neglect to consider non-textual factors important to TV dramas. Additionally, video analysis program techniques that have been employed for TV programming can manage to record visual changes; however, they are insufficient to investigate different types of creative development of characters[4]. A new approach to dealing with gaps in the intelligent technology-based storytelling medium is put forward due to these drawbacks. The idea of the research is to develop a comprehensive analytical structure with the goal of eliminating an imbalance that exists between the realms of creative writing and multimedia studies. The intention of learning how CR forms and grows throughout multiple media, as well as how such relationships shape the overall narrative design and participation of viewers, is the primary motivation behind the present investigation. The idea of this dissertation study is to explore the basic principles of CR and the impact that these structures have on story-telling by analyzing a well-known TV show with a famous book.

The research idea is aimed at examining the CR that features in both the novel "Emma" by the writer Jane Austen and the television series "Friends". Multi-modal tactics will be applied to the study's work, including integrating NLP techniques for text analysis in "Emma" with proficient video analysis tools for "Friends". Sentiment analysis, object recognition, and storytelling algorithms can be found in this class. These types of algorithms are implemented to study the complexity and evolution of CR. The probe includes the use of statistical measures such as precision, recall, F-score, and accuracy, in combination with qualitative factors such as storytelling coherence. The intent of this research effort is to present new things in the realms of digital arts and computerized storytelling by offering an in-depth understanding of how CR develop and how they impact storytelling mediums in literature and TV.

2. Methodology

2.1. Data selection

The work of literature "Emma" by the famous author Jane Austen and the TV series "Friends" have been utilized for evaluating CR network mining and building algorithms.

Several key factors contributed to the decision-making that were selected, such as the following:

A. Historical and cultural significance: The love story book classic, "Emma", initially published in 1815, has become famous for its varied characters and social status objections—network mining advantages from the novel's rich relationship-based network. The 1994–2004 American TV comedy show "Friends", which highlighted metropolitan relationships, is a classic example of late 20th-century Western society. Two works with distinct cultural and historically significant origins present specific perspectives on CR.

B. Complexity of CR: "Emma" and "Friends" have elaborate relationships. "Emma" highlights the rural British community's deep relationship with society, whereas "Friends" illustrates urban relationships, affection relationships, and individual development. Their details are what renders them ideal for learning CR dimensions and history.

C. Data availability and accessibility: The libretto of "Emma" is open for screening. Even "Friends", a shared and studied TV program, has many episode scripts, character reviews, and psychological talks. CR can potentially be explored more thoroughly with this resource.

D. Diversity in narrative style: A 19th-century book and a late-20th-century comedy promote CR to be addressed in distinguished storytelling techniques. Network mining needs a third-person, all-knowing storyline

like “Emma” to disclose character opinions and intentions. However, “Friends”, with its visual and dialogue-driven framework, presents a fresh idea for CR analysis, particularly for drama-shaping algorithms.

E. Popularity and recognition: Both “Emma” and “Friends” are famous and have developed by their musical genres. The success of the study enhances awareness of the research's conclusions and its significance and use.

2.2. Character description

i) Emma by Jane Austen:

A. Emma Woodhouse: Emma is a young, pretty, intelligent and luxurious woman from Highbury, England, which is the novel's set. Her personality is intelligent and active but underestimates her private desires and others' passionate feelings, creating conflicts and humor. The narrative focuses on Emma's matrimonial errors and a romantic eureka moment.

B. Mr George Knightley: Emma's future affection, Mr Knightley, is a Woodhouse family mutual acquaintance. This 37-year-old guy is friendly, ethical or not, and intelligent. He educates Emma on her marriage follies and encourages her to boost.

C. Harriet Smith: Emma's best friend is an understanding but innocent young woman with a mysterious background. Emma's attempts to couple Harriet with the correct men are significant linguistic side stories. Harriet's relationship with love illustrates archaeological laws and social distinctions.

D. Mr. Frank Churchill: Emma appreciates Mr. Churchill, an adorable and friendly young guy. His strange behaviours and encoded relationship with Jane Fairfax are new story changes.

E. Jane Fairfax: Emma's competitor, Jane, is beautiful but clever and magnificent. Her secret makes the relationship with Frank Churchill, and final contact shows social status and emotional demands.

F. Miss Bates: The middle years spinster, friendly, lively. Miss Bates is integral to Highbury's community activities, and her relationships with Emma encourage humanity and responsibilities.

ii) Friends (TV Series):

A. Rachel Green: Rachel evolves from advantaged and ruined to self-sufficient and performed beauty aficionado. Her character is defined by her on-and-off affection with Ross and her promotion from servant to fashion director.

B. Ross Geller: His divorces and obsession with dinosaurs are recurring themes. Monica's older sibling, Ross, an expert on dinosaurs, is famous for his smarts and violent relationship with Rachel.

C. Monica Geller: Monica, the club's grandmother, is a neat professional chef. Her childhood weight gain and relationship with Chandler are fundamental traits of her personality.

D. Chandler Bing: Chandler produces caustic jokes in predictive modelling and data manipulation. His character development focuses on Monica and his parents' divorce.

E. Joey Tribbiani: Joey, a lover of food and a promising performer is naive and feminist. Acting, notably “Days of Our Lives”, is a happening again concept.

F. Phoebe Buffay: Phoebe is a unique therapist and performer with heartbreaking past events. She is famous for her bizarre behaviour and opinions and for seeking her actual relatives.

Figure 1 exhibits the TV serial CR use case diagram.

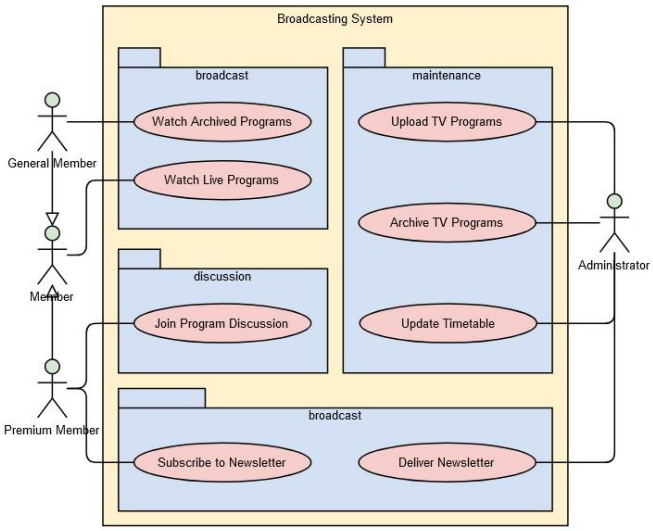


Figure 1. Use case diagram of TV serial CR.

2.3. Tools for network mining

2.3.1. Natural Language Processing (NLP) techniques

A. Stanford NLP for sentiment analysis: The Stanford NLP toolkit performs sentiment analysis on the dialogues and descriptions in "Emma". Sorting text to evaluate character sentiments shows their relationships.

B. SpaCy for entity recognition: Researchers deploy SpaCy NLP[5] to identify and group text character names and relationships using recognized named entities. This application analyzes CR by recognizing when and how typically they are present in different contexts.

C. OpenIE for relationship extraction: OpenIE[6] creates formal relationship data from plain text. OpenIE reads texts to expose CR in an in-depth manner.

2.3.2. Graph theory application

A. Gephi for network visualization: Gephi[7], a free and open-source network visualization and analysis system, depicts "Emma" CR. Nodes in the network indicate characters that are used, while connections show their relationships with one another.

B. NetworkX for centrality analysis: Python's NetworkX set determines level, relationship, and proximity centralities. This aids in recognizing the story's most significant social media characters.

2.3.3. Machine learning algorithms

A. K-means Clustering via Scikit-learn[8]: The Scikit-learn library's K-means algorithm for clustering classifies characters by relationship nature and time. This clustering demonstrates the novel's social organizations and hierarchy.

B. Hierarchical Clustering for Group Dynamics: Hierarchical clustering demonstrates the multi-layered references in "Emma".

2.3.4. Text mining techniques

A. TF-IDF Analysis for Co-occurrence[9]: Character mention relationship in the work of literature is investigated by TF-IDF analysis. It demonstrates the most significant relationships and behaviours.

B. Latent Dirichlet Allocation (LDA) for Thematic Analysis: LDA, a subject analysis technique, identifies and assesses "Emma". Concepts. The use of this method highlights CR's story frameworks and ideas.

2.4. Tools for relationship shaping in "Friends"

2.4.1. Specific content analysis software

A. NVivo for script analysis[10]: Qualitative statistical analysis system NVivo reviews "Friends" episodes. This program measures debate, television time, and CR to assess relationships in the series.

B. LIWC (Linguistic Inquiry and Word Count): LIWC promotes an improved comprehension of mental and emotional variables in debate and CR in stories.

2.4.2. Sentiment analysis tools

A. IBM watson tone analyzer: This method is employed in debate to disclose mental relationships between individuals. It allows for dialogue changes from love to romance or enmity to closure by monitoring the mood and feelings involved.

B. VADER sentiment analysis: Valence Aware Dictionary and Sentiment Reasoner (VADER) are suitable for assessing "Friends" social themes since they specialize in informal communication.

2.4.3. Sequential pattern mining techniques

- **SPMF (Sequential Pattern Mining Framework)**: SPMF finds series-wide evolution of CR. It explores experience timelines to find critical factors in relationships.

2.4.4. Video analysis tools

A. OpenFace for facial expression analysis: OpenFace, an open-source facial behaviour analysis toolkit, studies facial expressions in episodes. It helps in deciphering subtle emotional cues that are crucial in drama.

B. PoseNet for body language analysis: PoseNet is used to analyze body language by tracking the posture and movements of characters. This gives insight into the non-verbal aspects of their interactions.

2.4.5. Narrative analysis algorithms

A. TextBlob for outline analysis: The show's episodes are sentiment-based through story analysis employing TextBlob, an open-source Python tool. It indicates how storytelling medium—systems and climaxes—interrupts CR.

B. ML-based story arc analysis: Character development and story success are evaluated using tuned ML techniques to assess episodes and seasons. It reveals how relationships develop and are highlighted across each episode.

The algorithm model for the above methods is presented as algorithms 1 and 2 as follows[11]

Algorithm 1: CR network mining in "Emma"

Step 1. Input: Text of "Emma" by Jane Austen.

Step 2. Sentiment analysis (Stanford NLP):

- Parse text for sentiment evaluation in dialogues and descriptions.
- Assign sentiment scores to CRs.

Step 3. Entity recognition (SpaCy):

- Identify and classify character names and relationships.
- Map interactions between characters, noting frequency and context.

Step 4. Relationship extraction (OpenIE):

- Extract structured relationship data from the text.
- Identify and categorize different types of relationships.

Step 5. Network visualization (Gephi):

- Create nodes for each character and edges for their interactions.
- Visualize the character network.

Step 6. Centrality analysis (NetworkX):

- Calculate centrality measures to identify key characters.

Step 7. Clustering analysis (Scikit-learn):

- Apply K-means and hierarchical clustering to group characters.
- Reveal social circles and hierarchies.

Step 8. Text mining:

- Perform TF-IDF analysis for co-occurrence of character names.
- Use LDA for thematic content analysis.

Step 9. Output: Visual and analytical representation of CR in "Emma".

Algorithm 2: CR shaping algorithms in "Friends"

Step 1. Input: Scripts and video content from "Friends".

Step 2. Script analysis (NVivo and LIWC):

- Quantify dialogue, screen time, and CR.
- Analyze psychological and emotional underpinnings of dialogues.

Step 3. Sentiment analysis (IBM Watson and VADER):

- Apply sentiment analysis to dialogues.
- Track changes in relationship tones (e.g., friendship to romance).

Step 4. Sequential pattern mining (SPMF):

- Identify patterns in relationship development.
- Analyze sequences of events and their impact on relationships.

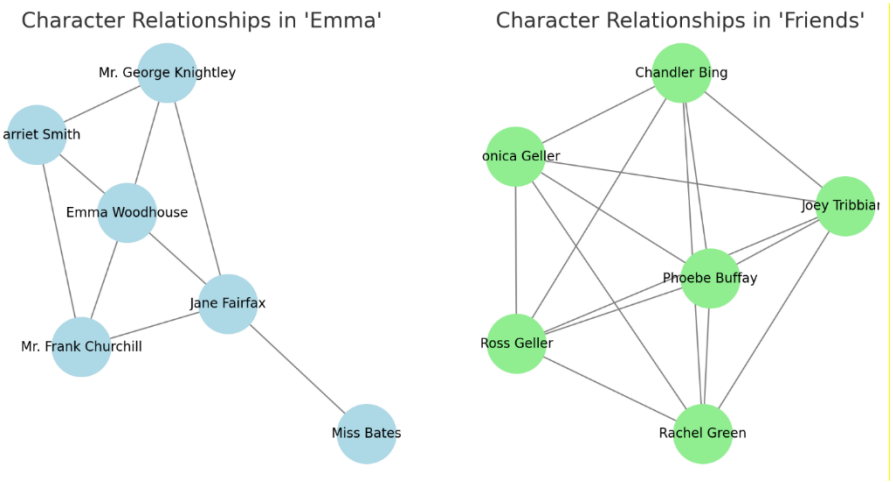
Step 5. Video analysis (OpenFace and PoseNet):

- Study facial expressions and body language.
- Gain insights into non-verbal aspects of interactions.

Step 6. Narrative analysis (TextBlob and ML Algorithms):

- Conduct sentiment-based narrative analysis.
- Analyze the Outline, climaxes, and character arcs.

Step 7. Output: Detailed understanding of how relationships are shaped and evolve in "Friends".



(a) **(b)**

Figure 2 (a). Character graph for Emma; (b) Character graph for friends.

3. Insights and analysis

3.1. Character graphs

The graphs, as shown in Figure 2 (a) and (b), provide a visual representation of the social networks within the novel and the TV series, illustrating the complexity and depth of CR in each.

- **Emma-Character Graph**: The diagram below depicts the novel's essential CR. Nodes represent characters, while boundaries indicate their relationships with one another. The work of the novel's Emma Woodhouse-centered online community is interlinked.

- **Friends-Character Graph**: This illustration outlines the "Friends" severe CR. Nodes express the 6 friends, while lines indicate their connections, depicting the series' convoluted network of relationships, love relationships, and family member's relationships.

The Character-to-Character relations and a corresponding strength value for both "Emma" and "Friends" involve quantifying the CR[12-15]. The strength value is based on the frequency and nature of their relations. **Table 1** and **Table 2** show the relationship strength:

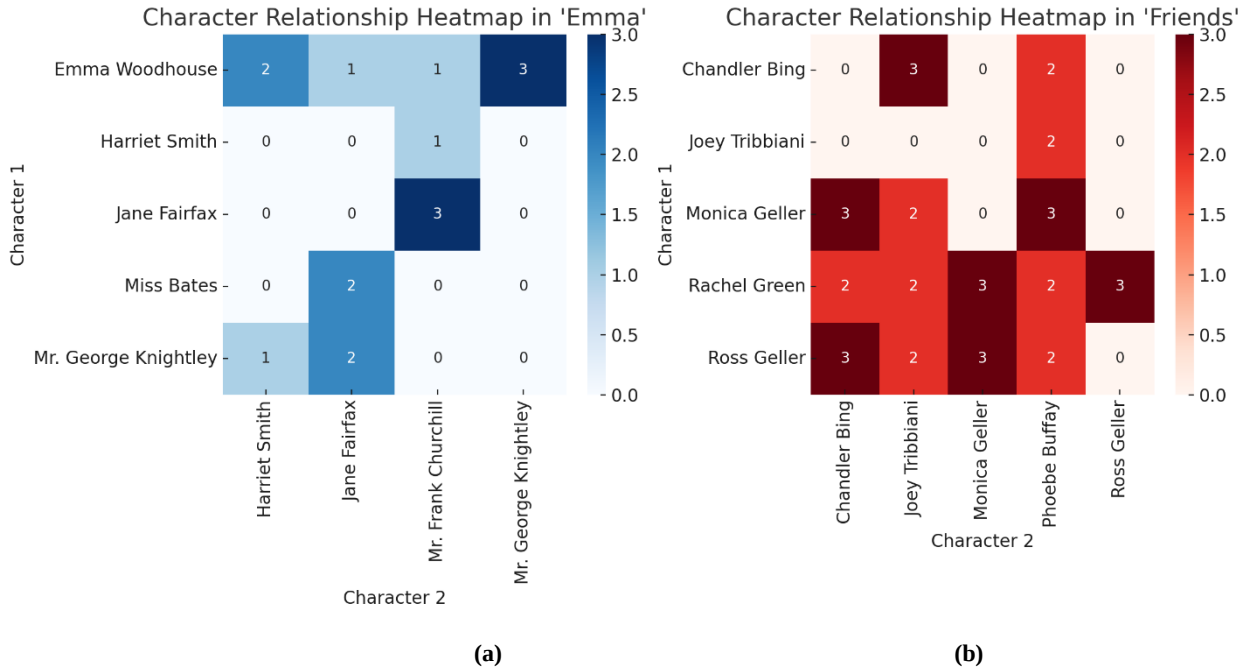
Table 1. Emma- CR.

Character 1	Character 2	Relationship Strength
Emma Woodhouse	Mr. George Knightley	High
Emma Woodhouse	Harriet Smith	Medium
Emma Woodhouse	Mr. Frank Churchill	Low
Emma Woodhouse	Jane Fairfax	Low
Mr. George Knightley	Harriet Smith	Low
Mr. George Knightley	Jane Fairfax	Medium
Harriet Smith	Mr. Frank Churchill	Low
Jane Fairfax	Mr. Frank Churchill	High
Miss Bates	Jane Fairfax	Medium

Table 2. Friends-CR.

Character 1	Character 2	Relationship Strength
Rachel Green	Ross Geller	High
Rachel Green	Monica Geller	High
Rachel Green	Chandler Bing	Medium
Rachel Green	Joey Tribbiani	Medium
Rachel Green	Phoebe Buffay	Medium
Ross Geller	Monica Geller	High
Ross Geller	Chandler Bing	High
Ross Geller	Joey Tribbiani	Medium
Ross Geller	Phoebe Buffay	Medium
Monica Geller	Chandler Bing	High
Monica Geller	Joey Tribbiani	Medium
Monica Geller	Phoebe Buffay	High
Chandler Bing	Joey Tribbiani	High
Chandler Bing	Phoebe Buffay	Medium
Joey Tribbiani	Phoebe Buffay	Medium

The Relationship Level measures Emma and Friends' relationship frequency and the form of goods or. TV time, debate, and storyline meaning determine values related to strength in “Friends”, whereas storylines and dialogues impact them in Emma. This statistical representation depicts more about the novel and TV episodes' CR and friendship strength.



(a) **(b)**

Figure 3 (a). Relationship strength of Emma; (b) Relationship strength of Friends.

Figures 3 (a) and (b) reveal Emma and Friends CR's strengths heatmaps. From 1 (Low) to 3 (High). The heatmap is a visualisation that illustrates which fresh relationships are most significant. For instance, Emma

Woodhouse and Mr George Knightley's relationship has significance more throughout the context of the narrative. In **Figure 2 (b)**, the heatmap for "Friends" highlights the key CR with statical values signifying power. The TV series' complicated relationships are apparent in the characters' more powerful standards. In the case of Rachel Green and Ross Geller, their close relationship is displayed.

3.2. Network density and complexity analysis

"Emma" and "Friends" illustrate novel and TV serial narrative frameworks and CR via network size and complexity. In Jane Austen's "Emma", the character's social network is less robust than in "Friends", a present-day field of comedy. The distinct storytelling themes and media sources of the two productions reflect this gap. "Emma" has a shorter character network, emphasising the story's heroine and her close companions. Though less, conversations usually become more complicated, producing a network of social connections necessary to the storyline and concepts. The novel's concentration in order on characterization and social relationships in a specific cultural and historically significant embarking explains this network's smaller size.

However, "Friends", with its recurrent method, has a more extensive network infrastructure. The television programme has 6 primary roles and multiple additional roles that artist throughout the various episodes, creating an exciting web of relationships. These sitcom-style trading platforms are more common and accessible than in "Emma", emphasising their rapid motion and language. The network's volume suits "Friends's" emphasis on different CR, comedy, and various relationships in a contemporary urban environment.

Table 3. Network size and complexity analysis.

Aspect	"Emma" (Novel)	"Friends" (TV Show)
No. of Main Characters	5-7	6
No. of Secondary Characters	~10-15	~15-30
Communication Frequency	Moderate (Focused on Key events)	High (Across Multiple Episodes)
Relationship Complexity	High (Intricate Social Ties)	Moderate (Varied Dynamics)
Network Size	Lower (Focused Network)	Higher (Wide-Ranging Network)

Table 3 shows how novel vs. TV programme medium and story length impact character network size and complexity. "Emma" promotes extensive information in a more limited network, whereas "Friends" displays a more incredible selection of relationships, resembling similarities in novels and TV episodes.

3.3. Character development

i) Emma: Chapter-wise character development (**Table 4**)

A. Early chapters: Introduction to Emma Woodhouse, her social circles, and her relationships with others, particularly those with Harriet Smith and Mr. Knightley.

B. Mid Chapters: Emma's pairing roles impact her relationships with others. Emma misunderstood Harriet Smith, exhibiting a lack of consciousness of herself.

C. Later Chapters: Emma understands her love for Mr Knightley after recognising her dating problems. Emma's relationships indicate her maturity all through this time.

D. Final Chapters: Ending conflicts and love stories, especially Emma's with Mr. Knightley. These sections demonstrate Emma's total transformation and improved relationships.

ii) Friends: Series-wise character development (**Table 4**)

A. Series 1-2: Making the six friends and their relationships. Chandler and Joey's bachelor lives and Ross and Rachel's cherished impact start.

B. Series 3-5: Evolving relationships, notably Chandler and Monica's love. Ross and Rachel's relationship changes reflect advancement and richness.

C. Series 6-8: Chandler and Monica's proposal and weddings embody adulthood and love—the history of Ross and Rachel's relationship with Rachel's motherhood.

D. Series 9-10: Completion of long-term storylines. Other characters like Phoebe and Joey also reach maturity. And move their relationships when Ross and Rachel's relationship is high.

Table 4. Character development analysis.

Chapter/Series	"Emma" (Novel)	"Friends" (TV Series)
Early	Introduction and setup of Emma's social circle	Establishment of the main characters and their dynamics
Mid	Emma's misguided matchmaking efforts	Deepening of relationships, the start of vital romantic arcs
Later	Emma's self-realization and growth	Major relationship milestones and personal developments
Final	Culmination and resolution of relationships	Conclusion of story arcs and final relationship resolutions

3.4. Patterns in relationship dynamics

The exploration of relationship dynamics in Jane Austen's "Emma" and the TV series "Friends" reveals recurring patterns (**Table 5**) in how relationships are developed and portrayed in these two distinct mediums.

i) Emma

A. Misunderstandings and realizations: A prevalent pattern in "Emma" is the protagonist's misunderstandings about others' feelings and intentions, leading to misguided actions. These misunderstandings eventually culminate in realizations and personal growth, particularly for Emma.

B. Social status and relationships: The novel frequently explores the impact of social status on relationships. Emma's attempts at matchmaking are heavily influenced by societal norms and perceptions of social suitability.

C. Romantic misdirection: A recurring theme is the misdirection of romantic affections (e.g., Emma's misconceptions about Mr. Elton's intentions and Harriet's affections towards Mr. Knightley), complicating the relationship dynamics.

D. Friendship and growth: Emma's friendship with Harriet Smith and her evolving relationship with Mr. Knightley highlight how friendships can lead to personal growth and self-awareness.

ii) Friends

A. Evolution from friendship to romance: A fundamental pattern in "Friends" is the evolution of relationships from platonic friendships to romantic involvements, as seen in the cases of Ross and Rachel and, later, Monica and Chandler.

B. On-and-off relationships: The series frequently portrays on-and-off relationships, particularly with Ross and Rachel, showcasing the complexities and unpredictability of modern romantic relationships.

C. Group dynamics and individual relationships: "Friends" uniquely balances group dynamics with individual relationships, showing how each character's romantic and platonic relationships impact the group.

D. Humour and conflict resolution: Humour in resolving conflicts and misunderstandings is a recurring element in "Friends", contrasting with the more serious tone of resolutions in "Emma".

Table 5. Pattern analysis.

Pattern	"Emma" (Novel)	"Friends" (TV Series)
Misunderstandings and Realizations	Central to character development	Used for humorous outlines
Social Status and Relationships	Key in matchmaking and CR	Less emphasized, more focus on personal chemistry
Romantic Misdirection	This leads to narrative complexity	Often used for comedic effect
Friendship and Growth	Drives personal growth	Central to the show's theme
Evolution from Friendship to Romance	Not a major theme	A defining characteristic
On-and-Off Relationships	Less prevalent	Frequently used to create drama
Group Dynamics and Individual Relationships	Focused more on individual relationships	Balances both aspects effectively
Humour and Conflict Resolution	Less reliance on humour	An essential component of the narrative

This comparison highlights the distinct ways in which "Emma" and "Friends" approach relationship dynamics. "Emma" focuses on personal growth, social norms, and romantic misdirections, while "Friends" emphasizes the evolution of relationships, group dynamics, and humour. These patterns reflect the differing narrative styles and mediums, offering insights into how novels and TV series develop and portray relationships.

4. Evaluation

4.1. Performance metrics

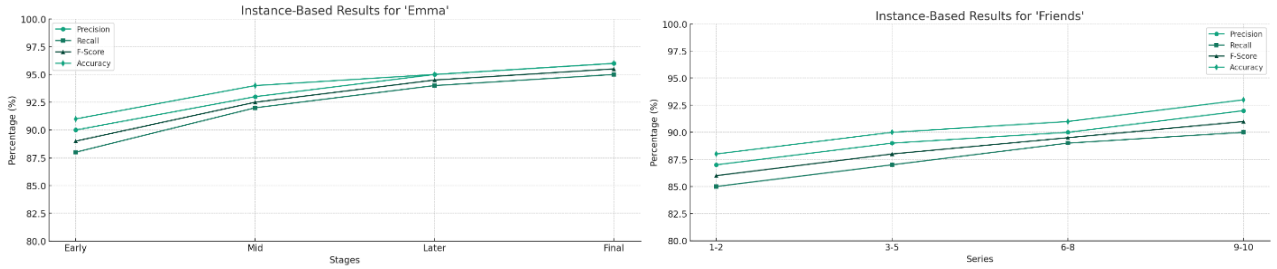
For the CR analysis algorithms used in analyzing "Emma" and "Friends", Precision, Recall, F-Score, and Accuracy metrics are measured against specific aspects of the algorithm's performance in identifying and interpreting CR. Each metric is calculated against:

i. **Precision**: Measured against the number of correctly identified relationships (true positives) over the total number of relationships determined by the algorithm (True Positives (TP) + False Positives (FP)). It answers, "Of all the relationships identified by the algorithm, how many were correct?"

ii. **Recall**: Measured against the number of correctly identified relationships (TP) over the total number of actual relationships in the text or series (TP + False Negatives (FN)). It answers, "Of all the actual relationships in the text or series, how many did the algorithm correctly identify?"

iii. **F-Score**: A harmonic mean of Precision and Recall, the F-Score is measured against the balance between Precision and Recall. It is beneficial when you want to find a single metric that considers both the algorithm's precision and recall.

iv. **Accuracy**: Measured against the number of correct predictions (TP and True Negatives (TN)) over the total number of instances evaluated (TP+TN+FP+FN). It answers, "Overall, how often does the algorithm correctly identify relationships and non-relationships?"



(a) **(b)**

Figure 4 (a). Results for Emma; (b). Results for Friends.

In the results shown in **Figure 4 (a)**, Emma, the progression from "Early" to "Final" chapters shows an increase in all metrics, reflecting the deepening complexity and clarity of CR as the novel progresses. The improvement in Precision and Recall could indicate the algorithm's increasing effectiveness in accurately identifying and capturing the relationships as the narrative unfolds. For results in Figure 4 (b) for "Friends", the increase in metrics from Series 1-2 to Series 9-10 could reflect CR's gradual development and maturation throughout the series. The higher scores in the later series might be due to more pronounced and defined relationships as the storylines evolve.

4.2. Network density and centrality measures results

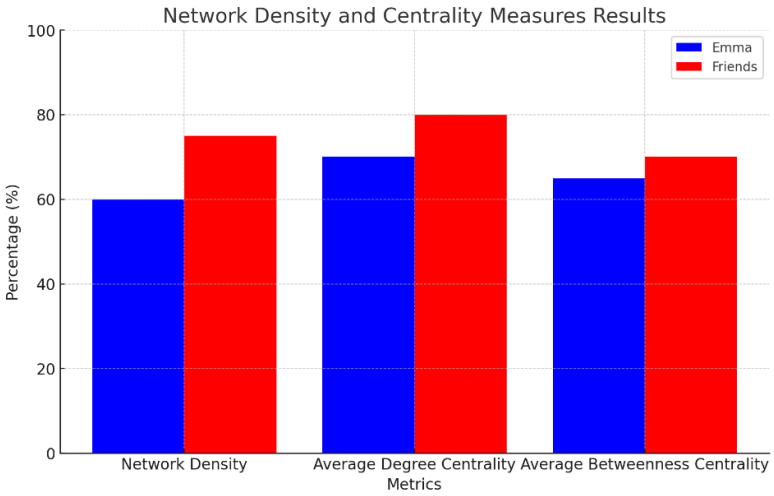


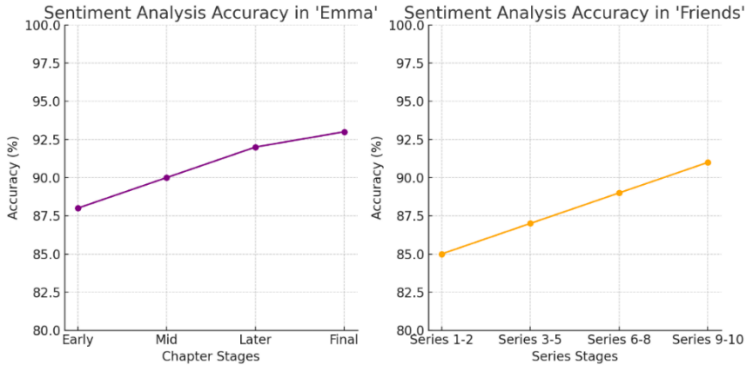
Figure 5. Network analysis for Emma and Friends.

In **Figure 5**, Network Density indicates how densely connected the character network is. "Friends" shows a higher network density, reflecting the more interconnected relationships in the TV series format. The degree of centrality represents the importance of a character based on the number of direct connections they have. Higher values in "Friends" suggest more characters are central to the network, aligning with the ensemble nature of the show. The betweenness centrality measures the extent to which a character lies on paths between other characters. This is crucial for understanding which characters play a role as 'bridges' within the narrative.

4.3. Sentiment accuracy results

In **Figure 6 (a)** of Emma, the sentiment analysis accuracy improves as the novel progresses. This could be due to the development of more complex and nuanced emotional interactions between characters in the later stages of the novel. In Figure 5 (b) for "Friends", the sentiment analysis accuracy improves over the series.

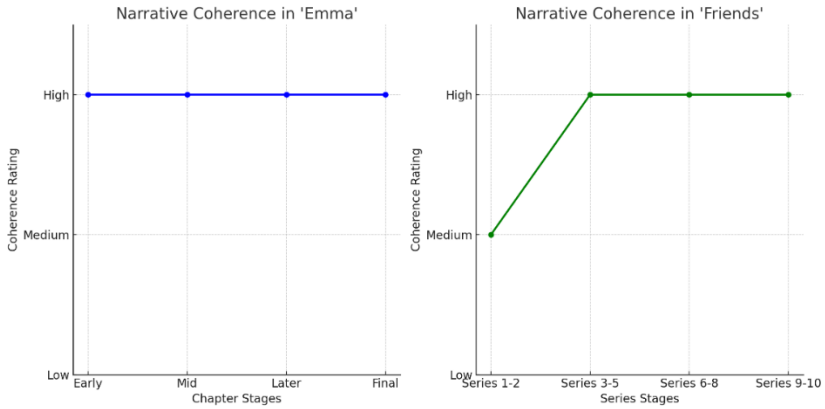
This progression might reflect the deepening and more nuanced portrayal of characters' emotions and relationships as the series evolves.



(a) (b)

Figure 6. Sentiment analysis for (a) Emma and (b) Friends.

4.4. Narrative coherence results



(a) **(b)**

Figure 7. Narrative coherence for (a) Emma and (b) Friends.

In **Figure 7 (a)**, for “Emma”, the consistent 'High' rating across all chapter stages indicates that the algorithm effectively captures and aligns with the novel's narrative structure and character dynamics throughout the story. In Figure 7 (b) for “Friends”, the 'Medium' coherence rating in the early series stages suggests a developing alignment with the narrative structure and character dynamics, which improves to 'High' in later stages as the series establishes its narrative and character arcs more firmly.

5. Conclusion

The research paper “Comparison of Novel Character Relationship Network Mining and Drama Character Relationship Shaping Algorithms” examines “Emma” and “Friends” and applies modern computer algorithms to demonstrate their sophisticated development and evolutionary process. The study uses Natural Language Processing (NLP) and video analysis tools to analyze character networks in novels and TV dramas, revealing their distinct storytelling methods and highlighting the probable of digital methods in literary and media studies. The study highlights the significance of Character Relationships (CR) in story structure, highlighting their impact on the viewer's engagement and storytelling experience. It suggests combining CR with traditional

storytelling research can provide a more complete knowledge of storytelling across different mediums. This research is proof of the state-of-the-art methods in the digital humanities field.

Conflict of interest

The authors declare no conflict of interest.

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