

## AI-Enhanced Research and Analysis Framework (AI-ERA Framework)

In the development of this work, initial ideas and drafts were provided by OpenAI's ChatGPT, which were extensively modified and expanded upon by Jared Campbell. He can be reached at [jared@fit.edu](mailto:jared@fit.edu) for any questions.

The AI-Enhanced Research and Analysis Framework (AI-ERA Framework) is a pedagogical approach. This framework integrates generative artificial intelligence (GAI) tools, such as ChatGPT, into the educational process, enhancing traditional research and analysis methods across various disciplines. The AI-ERA Framework is designed to provide students with a comprehensive understanding of both subject-specific content and the practical applications of AI in research. It fosters skills in data analysis, critical thinking, ethical technology use, and collaborative problem-solving.

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## Objective:

The primary objective of the AI-ERA Framework is to equip students with the ability to effectively incorporate AI tools into their research and analysis projects, ethically, regardless of the academic discipline. This framework aims to:

1. **Enhance Research Skills:** Guide students in using AI tools to augment traditional research methods, improving the depth and breadth of their investigative work.
2. **Develop Analytical Competence:** Foster students' abilities to critically analyze and interpret data, using AI as a supportive tool for deeper insights and efficient data processing.
3. **Promote Ethical AI Usage:** Cultivate an understanding of ethical considerations in using AI, focusing on responsible and informed application of technology in academic work.
4. **Strengthen Teamwork and Communication:** Encourage effective collaboration and communication within diverse teams, utilizing AI tools to support these dynamics.

## Learning Outcomes:

1. **Enhanced Research and Analytical Skills:**
  - Develop proficiency in conducting thorough research using a combination of traditional methods and AI tools, leading to a deeper understanding of the subject matter.
  - Gain practical experience in data collection, preprocessing, and employing statistical analysis techniques across various contexts.
2. **Mastery of AI Tools in Research:**
  - Acquire the skill to effectively utilize AI tools like GAI for various stages of research, from data gathering to analysis interpretation.
  - Understand the capabilities and limitations of AI in academic research, learning to leverage AI for efficient data processing and gaining insights.
3. **Critical Thinking and Data Interpretation:**
  - Enhance critical thinking skills through independent data interpretation and thoughtful analysis, using AI as a supplementary tool.
  - Encourage analytical reasoning, allowing students to justify their choice of methods and interpret results with a critical eye.
4. **Ethical AI Usage and Digital Literacy:**
  - Cultivate an understanding of ethical considerations in using AI, including issues related to data integrity, privacy, and plagiarism.
  - Develop digital literacy skills, understanding how to responsibly integrate AI tools in academic work.
5. **Effective Communication and Collaboration:**
  - Strengthen abilities in teamwork and communication within diverse groups, navigating team dynamics and conflict resolution effectively.
  - Improve presentation and reporting skills, focusing on clear articulation of research processes, findings, and the role of AI.
6. **Reflective and Adaptive Learning:**

- Foster reflective learning practices through journaling and reporting, encouraging students to introspect on their learning journey and AI tool usage.
  - Promote adaptability and openness to new technologies, preparing students for evolving academic and professional environments.
- 7. Peer Review and Feedback Skills:**
- Develop skills in providing and receiving constructive peer feedback, enhancing collaborative learning and self-improvement.
  - Encourage the ability to evaluate and critique the contributions and teamwork dynamics objectively.
- 8. Cross-Disciplinary Application:**
- Equip students with a versatile framework that can be adapted to different academic disciplines, demonstrating the multidisciplinary application of AI in research.

## Methodology:

- 1. Literature Review and Problem Definition with AI Assistance:**
- Use GAI to conduct an initial literature review on a selected topic.
  - Critically evaluate the review, identifying strengths and weaknesses.
  - Expand this review with additional research.
  - Use expanded review and GAI to help find interesting problems to address within the selected topic.
  - Critically evaluate each problem and then define the problem that will be addressed.
- 2. Data Collection and Verification:**
- Instruct students on what data to gather.
  - Let them gather the data independently or as a team.
  - Use GAI for suggestions on potential data sources.
  - Cross-verify data sources with cited academic sources.
- 3. Data Preprocessing and AI Literacy:**
- Guide students to preprocess data manually.
  - Use GAI to explain preprocessing concepts, ensuring students understand the process.
- 4. Exploratory Data Analysis (EDA):**
- Conduct EDA using traditional statistical tools (Excel, JMP, SPSS, etc).
  - Utilize GAI for clarification of EDA concepts and interpretation guidance.
  - Allow students to explain why they used the particular statistical tools.
- 5. Statistical Analysis and Independent Application:**
- Have students perform their analysis using chosen statistical methods.
  - GAI can be used to explain methodologies but not to perform them.
  - Spreadsheet screenshots are encouraged.
- 6. Interpreting Results with Critical Thinking:**
- Students should interpret their results independently.
  - Use GAI to discuss interpretations, encouraging critical analysis.
  - Verify analysis using academic sources.
- 7. Reflective Reporting:**

- Require a report that includes a reflection on how GAI was used as a tool.
  - This encourages thoughtful and ethical use of AI.
- 8. Progress Check-Ins and Peer Review:**
- Include regular progress check-ins and a peer review process to ensure responsible use of AI.
- 9. Presentation with AI Insights:**
- Allow the use of GAI for presentation preparation advice.
  - Focus on students presenting their own analysis and insights.

## AI-ERA Deliverables

- **Preliminary Reports**
  - GAI literature review that has been expanded upon and critically reviewed using academic sources. Must include both the initial literature review and the student's expanded version.
  - Interesting Problems Report which includes evaluated problems and a defined problem to be addressed and why. Must include both the initial list of problems and the student's expanded version.
  - Both preliminary reports must contain references.
- **Detailed Project Report:**
  - Comprehensive documentation of the entire project, including data collection, preprocessing, analysis, and interpretation.
  - A section on ethical considerations in using AI and addressing plagiarism.
  - Reflection on the use of GAI and other AI tools, detailing how they assisted in various project stages.
  - The final submission must include both the initial AI-generated literature review and the student's expanded version.
- **Collaboration Report:**
  - A report that outlines the team dynamics, collaboration strategies, roles, and responsibilities.
  - Discussion of how AI tools were integrated into the group work and any challenges faced.
  - Summary of conflict resolution and peer learning experiences.
- **Data Analysis Results:**
  - Presentation of the data analysis findings, including statistical analysis and interpretations.
  - Visual aids like charts, graphs, and maps to illustrate as appropriate.
  - Presentation must include explanations of why each statistical method was used.
- **Peer Evaluation Forms:**
  - Confidential assessments completed by each team member, evaluating the contributions and collaboration of their peers.
- **Final Presentation:**
  - A comprehensive presentation showcasing the project findings, methodology, data analysis, and collaborative process.
  - A segment specifically reflecting on the use of AI tools and their impact on the project's outcome. Must include a discussion of the effectiveness of using the GAI and of the ethical considerations made when developing the preliminary report, the interesting problems report, and the data analysis presentation.

## Rubrics for AI-ERA Deliverables

### Rubric for AI-ERA Preliminary GAI Literature Review and Expansion

Criteria	Excellent (A)	Good (B)	Satisfactory (C)	Needs Improvement (D-F)
<b>AI Integration</b>	Seamlessly integrates GAI literature review with comprehensive expansion.	Integrates GAI review well but with minor gaps in expansion.	Adequate integration of GAI review, but expansion lacks depth.	Poor integration with GAI review; expansion is superficial or missing.
<b>Critical Evaluation</b>	Provides insightful critique of GAI review, with clear identification of strengths and weaknesses.	Offers a solid critique but may overlook some aspects.	Provides a basic critique but lacks detail or depth.	Critique is minimal or absent; does not effectively identify strengths or weaknesses.
<b>Research Depth</b>	Demonstrates extensive research beyond GAI output, with substantial academic sources that enhance the review.	Shows good research effort with relevant academic sources that complement the GAI review.	Research is sufficient but limited in scope; sources may lack variety.	Minimal research effort; relies heavily on GAI output with few or irrelevant sources.
<b>Insights and Conclusions</b>	Offers original insights and well-reasoned conclusions, demonstrating high-level critical thinking.	Provides clear insights and conclusions, with some evidence of critical thinking.	Presents basic insights and conclusions, but may be somewhat generic.	Lacks original insights; conclusions are unclear or unsupported.
<b>Use of Academic Sources</b>	Exceptional use of a broad range of relevant academic sources; properly cited throughout.	Good use of academic sources with proper citations, but range may be limited.	Adequate use of sources with some citation errors or inconsistencies.	Insufficient or improper use of academic sources; numerous citation errors.

**Rubric for AI-ERA Interesting Problems Report**

<b>Criteria</b>	<b>Excellent (A)</b>	<b>Good (B)</b>	<b>Satisfactory (C)</b>	<b>Needs Improvement (D-F)</b>
<b>Problem Identification</b>	Exceptionally identifies a relevant, clearly defined problem from the AI-generated list, demonstrating depth and originality.	Identifies a relevant problem that is well-defined, with some evidence of original thinking.	Adequately identifies a relevant problem, but definition lacks clarity or originality.	Problem identified is not clearly defined, relevant, or original in context.
<b>Critical Evaluation</b>	Provides an insightful and thorough evaluation of the AI-generated problems, identifying strengths, weaknesses, and gaps.	Offers a solid evaluation of AI-generated problems, but may miss less obvious strengths or weaknesses.	Evaluation of AI-generated problems is present but superficial and lacks detail.	Minimal or no real evaluation of the AI-generated problems; lacks depth.
<b>Research and Expansion</b>	Demonstrates extensive research to expand upon the AI-generated problems, adding significant depth and context.	Conducts good research to expand upon AI-generated problems, but with limited scope.	Research to expand on AI-generated problems is adequate but lacks comprehensive context.	Fails to conduct sufficient research to expand upon the AI-generated problems meaningfully.
<b>Use of Academic Sources</b>	Utilizes a wide range of academic sources to substantiate the problem definition and expansion effectively.	Uses relevant academic sources to support problem definition, but variety may be limited.	Sources used are adequate but may not fully support the problem's definition and expansion.	Insufficient use of academic sources, with many missing or irrelevant references.
<b>Clarity and Coherence</b>	Report is exceptionally clear, well-organized, and logically structured, with a coherent argument throughout.	Report is clear and generally well-structured, with a coherent argument in most sections.	Report is somewhat clear and organized but may lack coherence in places.	Report is poorly structured, lacks clarity, and does not form a coherent argument.



**Rubric for AI-ERA Detailed Project Report**

<b>Criteria</b>	<b>Excellent (A)</b>	<b>Good (B)</b>	<b>Satisfactory (C)</b>	<b>Needs Improvement (D-F)</b>
<b>Comprehensiveness</b>	Report thoroughly documents all project stages with exceptional detail and clarity, including data collection, preprocessing, analysis, and interpretation.	Report adequately documents all project stages but may lack detail or clarity in some areas.	Report covers all key project stages but is superficial in coverage and lacking in detail.	Report fails to document all project stages comprehensively or clearly.
<b>Data Collection &amp; Preprocessing</b>	Demonstrates an in-depth understanding of data collection methods and preprocessing steps, with evidence of rigorous implementation.	Shows a good understanding of data collection and preprocessing, with minor gaps in implementation.	Adequate understanding of data collection and preprocessing but lacks thoroughness in implementation.	Limited understanding of data collection and preprocessing, with significant gaps in implementation.
<b>Analysis &amp; Interpretation</b>	Provides a sophisticated analysis and interpretation of data, with nuanced insights and well-supported conclusions.	Analysis and interpretation are sound but may lack depth or nuanced understanding.	Analysis and interpretation are basic, with some relevant insights but generally lacking depth.	Analysis and interpretation are insufficient, with unclear or unsupported conclusions.
<b>Use of GAI and Other AI Tools</b>	Insightfully reflects on the use of GAI and other AI tools, detailing how they assisted at each project stage with critical evaluation.	Reflects on the use of AI tools with a good level of detail but may lack critical evaluation.	Provides a basic reflection on the use of AI tools, but details and critical evaluation are limited.	Reflection on AI tool use is minimal, lacking detail and critical perspective.
<b>Academic Integrity</b>	Explicitly addresses ethical considerations and plagiarism, demonstrating a high level of academic integrity.	Addresses ethical considerations and plagiarism with understanding, but may lack depth.	Mentions ethical considerations and plagiarism, but understanding and detail are limited.	Fails to address ethical considerations and plagiarism adequately.
<b>Integration of AI-Generated Content</b>	Seamlessly integrates AI-generated content with student's research, enhancing the project's quality and depth.	Integrates AI-generated content well, but integration may not enhance all aspects of the project.	Adequately integrates AI-generated content, but the contribution to the project's quality is limited.	Poor integration of AI-generated content; does not contribute meaningfully to the project.
<b>Clarity and Structure</b>	Report is exceptionally clear, well-structured, and logically organized, enhancing readability and understanding.	Report is clear and well-structured with minor issues in organization.	Report is adequately structured but may have clarity or organizational issues.	Report is poorly structured, lacks clarity, and is difficult to follow.

**Rubric for AI-ERA Collaboration Report**

<b>Criteria</b>	<b>Excellent (A)</b>	<b>Good (B)</b>	<b>Satisfactory (C)</b>	<b>Needs Improvement (D-F)</b>
<b>Team Dynamics</b>	Report provides an insightful analysis of team dynamics, with clear examples of effective collaboration and strategic role allocation.	Report describes team dynamics adequately but may lack specific examples or depth in collaboration strategies.	Report covers basic aspects of team dynamics but with minimal detail and lacks critical analysis.	Report fails to adequately describe team dynamics, with little to no evidence of effective collaboration.
<b>Roles and Responsibilities</b>	Report details roles and responsibilities with a high degree of clarity, showing how each member contributed to the project.	Roles and responsibilities are defined, but descriptions may lack clarity or detail on individual contributions.	Some roles and responsibilities are outlined, but the report lacks comprehensiveness and specificity.	Roles and responsibilities are poorly defined, with unclear or missing information on individual contributions.
<b>Integration of AI Tools</b>	Demonstrates an in-depth understanding of how AI tools were integrated into the group work, with thoughtful reflection on challenges and solutions.	Describes how AI tools were used, with some reflection on challenges, but may lack depth or critical perspective.	Mentions the use of AI tools and some challenges faced but lacks detailed reflection and problem-solving.	Provides minimal or no reflection on the use of AI tools and challenges faced during group work.
<b>Conflict Resolution</b>	Provides a detailed summary of conflict resolution, showcasing effective communication and problem-solving strategies.	Describes conflict resolution adequately but with limited detail on the strategies used.	Briefly mentions conflicts and resolutions but lacks detail and demonstration of effective strategies.	Fails to adequately address conflict resolution or lacks evidence of any strategy implementation.
<b>Peer Learning Experiences</b>	Reflects on peer learning experiences with depth, illustrating how collaborative learning enhanced project outcomes.	Discusses peer learning experiences but with less depth, and may not clearly link to project outcomes.	Mentions peer learning experiences but fails to illustrate their impact on the project.	Lacks reflection on peer learning experiences or fails to mention them altogether.
<b>Clarity and Structure</b>	Report is exceptionally well-written, clear, and structured, facilitating easy understanding of collaboration processes.	Report is clear and structured, with minor issues that do not hinder the understanding of the collaboration processes.	Report is somewhat clear and structured but may be disorganized, affecting the clarity of the collaboration processes.	Report lacks clarity and structure, making it difficult to understand the collaboration processes.

**Rubric for AI-ERA Data Analysis Results**

<b>Criteria</b>	<b>Excellent (A)</b>	<b>Good (B)</b>	<b>Satisfactory (C)</b>	<b>Needs Improvement (D-F)</b>
<b>Statistical Analysis Quality</b>	Demonstrates a high level of competence in statistical analysis, with accurate results and insightful interpretations.	Competently conducts statistical analysis with mostly accurate results and sound interpretations.	Conducts basic statistical analysis with some inaccuracies or superficial interpretations.	Poor execution of statistical analysis, leading to inaccurate or irrelevant results.
<b>Use of Visual Aids</b>	Utilizes visual aids (charts, graphs, maps) exceptionally well, enhancing the clarity and understanding of data analysis findings.	Uses visual aids effectively, but some may not fully support or clarify the data analysis findings.	Visual aids are used, but they lack clarity or do not effectively illustrate the data analysis findings.	Inadequate or incorrect use of visual aids, hindering the understanding of data analysis findings.
<b>Explanation of Methodology</b>	Provides thorough and clear explanations for the choice of each statistical method, demonstrating deep understanding.	Provides good explanations for the choice of statistical methods, but some details may be lacking or unclear.	Offers basic explanations for the choice of statistical methods, but lacks depth or clarity.	Fails to adequately explain the choice of statistical methods or explanations are missing or incorrect.
<b>Interpretation of Data</b>	Offers a sophisticated and nuanced interpretation of data, linking analysis to broader context or implications.	Provides a solid interpretation of data, but may lack depth or broader context.	Interpretation of data is basic and may not fully capture its significance or implications.	Poor or inaccurate interpretation of data, with little to no meaningful insight.
<b>Clarity and Coherence</b>	Presentation of data analysis is exceptionally clear, coherent, and well-organized, facilitating easy understanding.	Presentation is clear and coherent but may have minor organizational issues.	Presentation is somewhat clear but may lack coherence or logical organization.	Presentation is poorly organized, lacks clarity, and is difficult to follow.

## Peer Evaluation Form for AI-ERA Project

**Project Title:**

**Evaluator's Name:**

**Team Member Being Evaluated:**

**Date:**

Each team member should complete a peer evaluation form for every other member of their team.

**Evaluation Criteria:** Please rate the team member on the following criteria, using a scale from 1 (Poor) to 5 (Excellent).

1. **Contribution to Project**
  - Actively contributed to project tasks and responsibilities.
  - 1  2  3  4  5
2. **Communication and Collaboration**
  - Effectively communicated ideas and cooperated with the team.
  - 1  2  3  4  5
3. **Quality of Work**
  - Produced high-quality work that met or exceeded project requirements.
  - 1  2  3  4  5
4. **Problem-Solving and Innovation**
  - Demonstrated creativity and effective problem-solving skills.
  - 1  2  3  4  5
5. **Ethical Use and Integration of AI Tools**
  - Appropriately and ethically used AI tools in line with project objectives.
  - 1  2  3  4  5
6. **Reliability and Responsibility**
  - Consistently dependable and took responsibility for their role in the project.
  - 1  2  3  4  5
7. **Adaptability and Flexibility**
  - Adapted to changes and showed flexibility in meeting project needs.
  - 1  2  3  4  5

**Additional Comments:**

**Overall Rating:** Please provide an overall rating for the team member's performance in the project. [ ]  
1  2  3  4  5

**Evaluator's Signature:**

**Rubric for AI-ERA Final Presentation**

<b>Criteria</b>	<b>Excellent (A)</b>	<b>Good (B)</b>	<b>Satisfactory (C)</b>	<b>Needs Improvement (D-F)</b>
<b>Content Comprehensiveness</b>	Presentation thoroughly covers project findings, methodology, data analysis, and collaborative process.	Covers most aspects of the project well but may lack detail in certain areas.	Adequately covers the project but lacks depth or misses some key aspects.	Fails to comprehensively cover the project; key aspects are missing or poorly explained.
<b>AI Tools Reflection</b>	Provides an insightful reflection on the use of AI tools, including detailed analysis of their impact on the project's outcome.	Reflects on the use of AI tools with good detail, but lacks depth in analyzing their impact.	Basic reflection on AI tools, but lacks depth and critical analysis of their impact.	Minimal or no reflection on the use of AI tools and their impact on the project.
<b>Ethical Considerations</b>	Demonstrates a deep understanding of ethical considerations in AI usage, linking them effectively to project stages.	Shows an understanding of ethical considerations, but the connection to project stages could be clearer.	Mentions ethical considerations, but lacks depth and clear relevance to the project.	Fails to address ethical considerations in AI usage adequately.
<b>Clarity and Organization</b>	Presentation is exceptionally clear, well-organized, and logically structured, enhancing audience understanding.	Presentation is clear and generally well-structured, with minor issues in organization.	Presentation is somewhat clear but may lack coherence or logical organization.	Presentation is poorly organized, lacks clarity, and is difficult to follow.
<b>Engagement and Delivery</b>	Engages the audience effectively with a dynamic and confident delivery; excellent use of visual aids.	Generally engages the audience with a good delivery; visual aids are used effectively.	Adequately engages the audience but lacks dynamism; visual aids are satisfactory.	Poor engagement with the audience; delivery is weak, and visual aids are poorly utilized.
<b>Discussion of Methodology</b>	Provides a thorough and clear explanation of the methodology, demonstrating a high level of understanding.	Good explanation of methodology but may lack some detail or clarity.	Basic explanation of methodology, but lacks thoroughness or clarity.	Fails to adequately explain the methodology or explanations are unclear.

## In-class Active Learning Activities that support AI-ERA Framework

### Problem Pitch Challenge:

**Objective:** To rapidly identify and pitch a problem based on the AI-assisted literature review.

**Activity:**

1. In groups, students spend 15 minutes using GAI for a literature review and identifying a key problem.
2. Each group then has 2 minutes to pitch their identified problem to the class.
3. After all pitches, spend 10 minutes in a class vote and discussion to select the most compelling problems.

**Outcome:** This fast-paced activity fosters quick thinking and persuasive communication, as students must identify and convincingly pitch a problem within a limited time.

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### Collaborative Research Expansion Quest:

**Objective:** To collaboratively identify areas for expanding an AI-generated literature review.

**Activity:**

1. Students form small groups and spend 10 minutes generating a literature review using GAI.
2. For 20 minutes, groups discuss and list potential areas for further research based on the review.
3. Each group chooses their top three expansion areas.
4. In the remaining 10 minutes, groups share their ideas, and the class discusses potential research strategies.

**Outcome:** This activity encourages collaboration and creative thinking in expanding AI-generated reviews within a short timeframe.

## Data Verification Challenge:

**Objective:** To practice and reinforce the skill of cross-verifying data sources for accuracy and reliability.

**Activity:**

1. Students individually or in teams gather data from various sources (including those suggested by GAI) on a given topic. Give them a time limit.
2. In a challenge format, students present their findings to the class, highlighting how they verified the accuracy of the information.
3. The class votes on the most thoroughly researched and verified presentation.

**Outcome:** This competitive format motivates students to thoroughly cross-check and validate their data, emphasizing the importance of accuracy in research.

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## Data Scavenger Hunt:

**Objective:** To develop skills in identifying and gathering relevant data for a given topic.

**Activity:**

1. Begin with a brief introduction on effective data collection strategies.
2. Assign each student or team a specific topic and ask them to use GAI to suggest potential data sources.
3. Students then embark on a 'data scavenger hunt,' seeking to gather information from these suggested sources within a set time limit (e.g., 20 minutes).
4. After gathering data, students spend the remaining time cross-verifying their data with academic sources, either online or through library resources.

**Outcome:** This activity encourages students to actively engage in the data collection process, emphasizing the importance of cross-verification with reliable sources for accuracy.

## Data Preprocessing Race:

**Objective:** To engage students in a competitive and fun way to practice data preprocessing skills.

**Activity:**

1. Divide the class into teams and provide each team with an identical raw dataset.
2. Set a time limit and challenge teams to preprocess the data as accurately and thoroughly as possible before time runs out.
3. After the race, compare the results of each team, discussing the techniques used and clarifying any misconceptions with the help of GAI.

**Outcome:** Encourages quick thinking and teamwork, while allowing students to practically apply preprocessing techniques in a time-pressured environment.

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## Data Preprocessing Peer Teach-Back:

**Objective:** To reinforce data preprocessing skills and AI literacy through teaching.

**Activity:**

1. Assign each student or group a specific aspect of data preprocessing learned through GAI.
2. Students prepare a mini-presentation or demonstration teaching this aspect to their peers.
3. During a class session, each student or group takes turns presenting their topic, explaining the concept and demonstrating its application on a sample dataset.
4. Encourage questions and discussions after each presentation for deeper understanding.

**Outcome:** This activity promotes a deeper understanding of preprocessing concepts as students teach their peers, reinforcing their own learning and fostering a collaborative learning environment.



## EDA Concept Challenge:

**Objective:** To deepen understanding of EDA concepts through a challenge-based approach.

**Activity:**

1. Present students with a list of common EDA concepts (e.g., mean, median, mode, variance, correlation).
2. In teams, students use a provided dataset to demonstrate these concepts using their choice of statistical tools.
3. Utilize GAI as an on-demand resource for students to ask questions or get clarification on these concepts.
4. Teams then share their findings with the class, explaining the significance of each concept in data analysis.

**Outcome:** Reinforces understanding of EDA concepts through practical application and peer teaching, encouraging collaborative learning.

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## Statistical Tool Showcase:

**Objective:** To encourage exploration and presentation of different statistical tools used in EDA.

**Activity:**

1. Assign different statistical tools to different student groups.
2. Each group conducts EDA on a given dataset using their assigned tool and prepares a short presentation.
3. In their presentation, groups should explain the features of the tool, why it was suitable for their EDA, and any interesting findings from their analysis.
4. Use GAI for any on-the-spot questions or additional explanations during the presentations.

**Outcome:** Students learn not only about the tool they used but also gain insights into other tools through peer presentations, enhancing their overall understanding of EDA tools.

## Critical Thinking Case Studies:

**Objective:** To apply critical thinking in interpreting data results through real-world scenarios.

**Activity:**

1. Provide students with case studies that include data results similar to what they might encounter in their projects.
2. Students analyze these case studies, interpreting the results and drawing conclusions.
3. Use GAI as a tool for students to ask questions or get guidance on interpreting these case studies.
4. Conclude with a class discussion where students share their interpretations and justify their reasoning, using academic sources for verification.

**Outcome:** Students learn to apply critical thinking to real-world data, enhancing their ability to interpret results accurately and thoughtfully.

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## Interpretation Verification Workshop:

**Objective:** To practice critical evaluation of data interpretations with a focus on academic source verification.

**Activity:**

1. Students conduct initial interpretations of a dataset and note down their findings.
2. In a workshop setting, use GAI to explore various ways of interpreting the same data, discussing the reasoning and implications.
3. Students then research academic sources to verify or challenge their initial interpretations.
4. The session concludes with students sharing how their interpretations were confirmed or altered by the academic research.

**Outcome:** Students learn the importance of backing up their data interpretations with credible academic research, enhancing their critical analysis and research skills.

## Cultural Studies Data Collection Exercise:

**Focus:** Data Collection and Verification

**Activity:**

1. Students choose a cultural topic and gather data using both GAI suggestions and independent research.
2. They cross-verify the authenticity and relevance of the data using academic and local sources, such as interviews or cultural artifacts.

**Outcome:** Encourages ethical consideration in data collection and enhances research skills in cultural studies.

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## Literary Theme Exploration with AI:

**Focus:** Exploratory Data Analysis (EDA)

**Activity:**

1. Students select a literary work and use GAI to assist in identifying themes and stylistic elements.
2. They then use traditional tools to analyze these themes further, explaining their choice of tools and methodologies.

**Outcome:** Develops skills in literary analysis and critical thinking, while integrating AI tools for initial insights.

## AI-Assisted Historical Analysis Challenge

**Focus:** Literature Review and Problem Definition with AI Assistance

### Activity:

#### Research Phase:

1. Students use GAI to conduct an initial literature review on a chosen historical event or period.
2. They critically evaluate this AI-assisted review, identifying strengths, weaknesses, and potential biases.
3. Students expand upon this review with additional research from primary and secondary sources, aiming to identify a unique problem or perspective related to the historical topic.

#### Challenge & Presentation Phase:

1. After completing their research, students participate in a "Historical Analysis Challenge."
2. Each student or group prepares a presentation showcasing their findings, the unique problem or perspective they identified, and how they used AI to aid their research.
3. The presentations should also include a critical evaluation of how AI influenced their research process and the conclusions drawn.

#### Peer Review & Discussion:

1. Following each presentation, there is a brief peer review session where classmates can ask questions, provide feedback, and discuss the historical and AI-assisted aspects of the research.
2. This session aims to encourage deeper engagement with the material and foster a collaborative learning environment.

### Outcome:

This activity enhances students' understanding of historical research and critical evaluation of AI-generated content.

## AI-Enhanced Persuasive Speech Challenge

**Focus:** Presentation with AI Insights and Reflective Reporting

**Activity:**

### **Preparation Phase:**

1. Students select a topic for a persuasive speech. This topic should be current, relevant, and allow for multiple viewpoints.
2. They use GAI to conduct preliminary research on their topic, gathering facts, statistics, and arguments.
3. Students critically evaluate the information provided by GAI, considering the credibility and relevance of the data to their speech.

### **Speech Development:**

1. Using the insights gathered, students develop a persuasive speech that incorporates AI-generated data while also expressing their unique perspective.
2. Encourage students to focus on key communication skills such as clarity, argument structure, and audience engagement.
3. Students should also reflect on how they integrated AI insights into their speech, assessing the tool's effectiveness and any ethical considerations.

### **Presentation and Feedback Phase:**

1. Students deliver their speeches in class, employing the skills and data they have gathered.
2. After each speech, conduct a feedback session where peers and the instructor provide constructive critiques, focusing on both the content and delivery of the speech.
3. Encourage a discussion on how AI tools influenced the speech content and the communication process.

### **Reflective Reporting:**

1. After the presentations, students write a reflective report on their experience, detailing how they used GAI, the challenges they faced, and how it impacted their communication style and effectiveness.

**Outcome:**

This activity enhances students' persuasive communication skills, incorporating AI tools for research and content development.

## Stand-alone assignment ideas

### Emphasize Personal Experience and Reflection:

Assignments should challenge students to draw on their personal experiences, beliefs, and opinions, while actively practicing the ethical use of AI. This includes critically applying AI tools in a manner that addresses and mitigates issues like bias, respects data privacy, and considers societal impact. Students should be prompted to integrate these ethical practices in their use of AI, reflecting on how their personal experiences and values align with responsible AI usage.

### Personal Environmental Impact Reflection:

- **Assignment:** Students use AI to analyze their personal carbon footprint based on their daily activities. They reflect on this AI-generated report, comparing it with their own understanding of their environmental impact, and devise a personal action plan to reduce their footprint, integrating scientific knowledge and ethical considerations.
- **Proof of AI Incorporation:** Submit both the AI-generated carbon footprint analysis and their personal action plan. Highlight how their reflection and scientific understanding informed the development of a more personalized and ethically responsible environmental plan.

### AI and My Future in Engineering:

- **Assignment:** Students use AI to explore potential future trends in engineering that align with their interests. They critically reflect on these trends, considering how they personally see themselves fitting into these future developments, and discuss the ethical implications they might encounter in their future engineering career.
- **Proof of AI Incorporation:** Include both the AI-generated future trends report and their personal reflection essay. Demonstrate how they used AI insights as a foundation for their personal career aspirations and ethical considerations in engineering.

### AI-Enhanced Self-Analysis:

- **Assignment:** Utilize AI tools to perform a basic personality or behavioral analysis. Students then critically examine this analysis, reflecting on its accuracy and what it reveals about their personality or behavior. They explore how psychological theories and their personal experiences align or differ from the AI analysis.
- **Proof of AI Incorporation:** Present the AI's personality or behavioral analysis alongside their own reflective analysis. Highlight the intersections and divergences between AI insights and their personal understanding, informed by psychological theories.

### AI in My Business Ethics Perspective:

- **Assignment:** Students use AI to generate a report on ethical business practices in a sector of interest. They critically reflect on this report in the context of their personal values and ethical perspectives, discussing how they would apply these principles in real-world business scenarios.
- **Proof of AI Incorporation:** Submit the AI-generated report on business ethics and their reflective essay. Emphasize how their personal ethical stance informed their critique and adaptation of the AI-generated content.

### Promote Critical Analysis and Ethical Reasoning:

Assignments should engage students in using AI tools to initiate inquiries or analysis, followed by a deeper, critical exploration of these initial findings. Encourage students to reflect on and ethically assess the AI-generated output, blending it with their critical thinking and subject knowledge. This approach should emphasize the importance of understanding and addressing issues like AI biases, ethical implications of AI in various contexts, and the responsible use of AI. The goal is to cultivate students' ability to not only discern the limitations and strengths of AI output but also to refine and elevate this output with their reasoned analysis and ethical judgment.

### AI-Enhanced Literature Review:

- **Assignment:** Students are tasked with using an AI tool to generate an initial literature review on a selected topic. Following this, they critically evaluate the AI's preliminary review, identifying strengths and weaknesses. They are then required to expand this review with additional research and provide their own insights and conclusions, creating a comprehensive and nuanced literature review.
- **Proof of AI Incorporation:** The final submission should include both the initial AI-generated literature review and the student's expanded version. Students must clearly articulate how they have built upon the AI's work, indicating where they have added depth, addressed oversights, and interjected personal scholarly insights, thus showcasing their research skills and critical thinking abilities.

### Data Analysis and Interpretation Project:

- **Assignment:** Utilize AI tools to conduct an initial data analysis on a provided dataset, focusing on aspects like statistical analysis and trend identification. Following this, students are required to critically evaluate the AI-generated findings, infusing their assessment with personal insights, additional data interpretation, and potential implications or areas for further research.
- **Proof of AI Incorporation:** Students should submit the original AI-generated data analysis along with their expanded interpretation. They must clearly highlight how their own analysis builds upon, refines, or challenges the AI's initial findings, demonstrating a comprehensive understanding of the data and its broader context.

### Ethical Business Strategy Formulation:

- **Assignment:** Students use AI to generate initial business strategies for a hypothetical company scenario. They then critically evaluate these strategies for ethical considerations, market feasibility, and sustainability, refining them into a well-rounded business plan.
- **Proof of AI Incorporation:** Provide the AI-generated business strategies and the revised plan. Detail the process of transforming AI suggestions into ethically sound and practical business strategies.

### **AI-Assisted Public Policy Analysis:**

- **Assignment:** Use an AI tool to generate a preliminary analysis of a current public policy issue (e.g., environmental regulation, healthcare policy). Students critically assess the AI's analysis, considering biases and ethical implications, and then develop a more comprehensive policy review incorporating their own research and perspectives.
- **Proof of AI Incorporation:** Submit the AI-generated analysis along with their expanded review. Highlight how their evaluation and additional research addressed potential biases or gaps in the AI's initial analysis.

### **Encourage Creative and Abstract Thinking:**

Assignments should demand creativity, abstract thinking, or artistic expression that AI cannot replicate. Include the ethical use of AI by fostering creativity in assignments while ensuring students consider ethical implications in their creative processes, especially when involving AI technologies.

### **AI-Initiated Scientific Illustration Analysis:**

- **Assignment:** Analyze an AI-generated basic interpretation of a scientific illustration. They then enhance this analysis by adding detailed scientific explanations, interpreting the illustration's accuracy, and discussing its significance in the field. This could include addressing how effectively the illustration conveys complex scientific ideas. Include references to published research.
- **Proof of AI Incorporation:** Submit both the AI-generated analysis and the student's enhanced version, highlighting where and how the student's scientific insights have expanded upon and improved the AI's initial interpretation.

### **Engineering/Technology Design Conceptual Challenge:**

- **Assignment:** Develop an AI-generated concept into a comprehensive engineering or technological design. The AI-generated concept could be the basis for an engineering or technological solution (e.g., a renewable energy device, a software interface design). Students would then develop this concept by applying engineering principles, considering ethical implications like environmental impact or user accessibility, and adding innovative design elements. Include references to published research.



- **Proof of AI Incorporation:** Provide the original AI concept alongside your developed design. Include a reflective comparison showing your application of engineering principles and ethical considerations to evolve the AI's initial idea.

### **Ethical Dilemma in Science Ethics Narrative:**

- **Assignment:** Expand an AI-generated narrative that presents an ethical dilemma in science or technology. Students would continue the narrative, exploring complex ethical questions in science and technology, possibly concluding with a resolution that reflects current ethical standards in STEM fields. Include references to published research.
- **Proof of AI Incorporation:** Present the original AI-generated story and your narrative extension. Clearly indicate how your continuation addresses the ethical issues and integrates scientific reasoning beyond the AI's setup.

### **Theoretical STEM Concept Abstract Exploration:**

- **Assignment:** Elaborate on an AI-generated exploration of a theoretical STEM concept. Provide in-depth analysis, implications, and future applications.
- **Proof of AI Incorporation:** Include the AI's initial exploration and your detailed expansion. Outline the ways in which your submission extends the AI's content with scientific theories, current research insights, and prospective implications.

### **Incorporate Hands-on Activities and Experiments:**

Include tasks that require physical interaction, such as experiments, fieldwork, or constructing models. Include the ethical use of AI by including physical experiments or projects where ethical discussions on AI are integral, such as the responsible use of AI tools in data collection or analysis.

### **AI-Assisted Environmental Study:**

- **Assignment:** Conduct a field study to collect environmental data (e.g., soil samples, water quality, biodiversity). Use AI tools to initially analyze the data, identifying key patterns or anomalies.
- **Proof of AI Incorporation:** Submit the AI analysis report along with a detailed comparison to manual findings. Highlight where the AI was effective and where manual verification or further investigation was needed, emphasizing the role of ethical responsibility in data interpretation.

### **Structural Model Building with AI Insights:**

- **Assignment:** Build a physical model of a structure (like a bridge, building, or machine part) based on initial AI-generated designs or stress analysis. The model could be constructed from materials like balsa wood, cardboard, or 3D-printed components.

- **Proof of AI Incorporation:** Present the AI's initial design or analysis alongside the completed model. Discuss how the AI input informed the building process and any adjustments made based on practical considerations, highlighting the balance between AI insights and hands-on expertise.

### **Business Market Analysis with AI Integration:**

- **Assignment:** Conduct a market analysis for a new product idea or business venture. Use AI tools to generate initial market data, trends, and consumer behavior insights. Based on this AI-generated data, develop a comprehensive business strategy, considering factors like marketing, pricing, and distribution.
- **Proof of AI Incorporation:** Submit the AI-generated market analysis along with the final business strategy. Highlight how the AI data was used to inform key business decisions and strategies, and discuss any modifications or additional insights added based on ethical considerations of market impact and consumer fairness.

### **Cultural Impact Study with AI Assistance:**

- **Assignment:** Investigate the impact of a historical event, art movement, or literary period. Utilize AI to gather initial information and perspectives. Then, conduct a deeper analysis that includes reviewing primary sources, scholarly articles, and personal interpretations to create a nuanced understanding of the cultural impact.
- **Proof of AI Incorporation:** Present the initial AI-generated overview alongside your in-depth analysis. Discuss how the AI insights were a starting point and how your subsequent research and personal interpretation provided a more comprehensive understanding, reflecting on the ethical use of AI in cultural and historical interpretation.

### **Foster Interpersonal Skills and Collaboration:**

Develop assignments that necessitate collaboration, negotiation, and social interaction. Include the ethical use of AI by designing group tasks that involve ethical decision-making in the use of AI, fostering a collaborative environment where ethical AI use is a key consideration.

### **Collaborative AI-Ethics Case Study Analysis:**

- **Assignment:** In groups, students use AI to generate a summary of a complex case study involving ethical dilemmas. They collaboratively analyze and discuss the AI-generated summary, then develop a joint report or presentation that includes their collective insights, ethical evaluations, and proposed solutions.
- **Proof of AI Incorporation:** The group submits both the AI-generated summary and their joint report. They must detail how they collaborated to critically analyze and expand upon the AI's output, showcasing their collective decision-making and ethical reasoning processes.

## AI-Assisted Business Strategy Development:

- **Assignment:** Student teams use an AI tool to generate preliminary business strategies for a hypothetical company. They work together to evaluate the AI strategies for feasibility and ethical implications, then collaboratively develop a comprehensive business plan that improves upon the AI's suggestions.
- **Proof of AI Incorporation:** The team presents the original AI-generated strategies along with their final business plan. They should explain how they collectively refined the AI's ideas, incorporating ethical business practices and innovative solutions.

## Group Project on AI and Cultural Impact:

- **Assignment:** Groups are tasked with using AI to gather information on the cultural impact of a technological advancement. They collaboratively analyze this AI-generated information, discuss its cultural and ethical implications, and create a joint presentation or paper that reflects their shared viewpoints and findings.
- **Proof of AI Incorporation:** Submit both the AI-generated information and the group's collaborative work. Highlight how the group used the AI's input as a starting point for a deeper, ethically-informed cultural analysis.

## Interdisciplinary AI Research Collaboration:

- **Assignment:** In interdisciplinary teams, students use AI to conduct preliminary research on a complex topic (e.g., climate change, healthcare innovation). They work together to critically assess the AI's research, integrating insights from their various academic backgrounds, and co-create a research paper or project that addresses ethical considerations and offers multidisciplinary perspectives.
- **Proof of AI Incorporation:** The team submits the AI's initial research output alongside their collaborative paper or project. They should illustrate how their interdisciplinary collaboration enriched and ethically grounded the AI's preliminary findings.

## Utilize Open-ended Questions and Scenarios:

Pose open-ended questions or scenarios that have multiple valid approaches or solutions. Include the use of AI by having it provide data or some other output. Students will then evaluate that data and compare it to published research about real world conditions.

## Environmental Decision-Making:

- **Assignment:** Students use an AI tool to analyze environmental data related to a specific issue (e.g., deforestation, urban development impacts). They are then presented with an open-ended scenario about making a policy decision based on this data. Students must explore multiple ethical viewpoints and propose a well-reasoned policy decision.

- **Proof of AI Incorporation:** Submit the AI-generated data analysis and the policy proposal. The submission should clearly articulate how the AI data was used as a basis for their decision-making and how ethical considerations were integrated into their policy recommendations.

### **Ethical Implications of AI in Healthcare:**

- **Assignment:** Utilizing AI, students generate an overview of how AI is revolutionizing a specific aspect of healthcare. They are then given a scenario involving an ethical dilemma related to AI in healthcare (e.g., patient data privacy, AI decision-making in treatment). Students must discuss and propose solutions to these dilemmas, considering different ethical perspectives.
- **Proof of AI Incorporation:** Include the AI-generated healthcare overview and their ethical dilemma analysis. Highlight how they used the AI's overview as a starting point for deeper ethical exploration and solution formulation.

### **Social Media Strategy Debate:**

- **Assignment:** An AI tool is used to develop a potential social media marketing strategy. Students are then given a scenario where this strategy raises ethical questions (e.g., user data usage, targeted advertising ethics). They must debate these issues, considering various ethical viewpoints, and propose a modified strategy.
- **Proof of AI Incorporation:** Present the AI-generated strategy alongside their revised, ethically-informed version. Detail the ethical considerations that led to modifications of the original AI proposal.

### **AI and Employment Ethics Discussion:**

- **Assignment:** Students generate a report using AI on the future of employment in a particular industry. They are then presented with a scenario about the ethical implications of AI integration in the workplace (e.g., automation and job displacement). Students need to discuss these implications and suggest ethical approaches to AI integration in employment.
- **Proof of AI Incorporation:** Submit both the AI-generated employment report and their discussion and suggestion document. Demonstrate how the AI report informed their understanding of the issue and how they ethically addressed the challenges presented in the scenario.

### **Integrate Cross-disciplinary Perspectives:**

Design tasks that require integrating knowledge from different disciplines, promoting a holistic understanding. Include the ethical use of AI by developing assignments that require students to evaluate ethical implications provided by AI from various disciplinary viewpoints, such as societal, legal, and technological perspectives.

### **Sustainable Urban Development Project:**

- **Assignment:** Students use AI to gather initial data on urban development challenges (e.g., traffic congestion, pollution, housing). They are then tasked with designing a sustainable urban development plan, integrating engineering solutions with considerations from urban planning, environmental science, and social welfare. The plan should address issues like energy efficiency, eco-friendly transportation systems, and community impact.
- **Proof of AI Incorporation:** Submit the AI-generated urban development data alongside the sustainable development plan. Students must detail how they used the AI data as a foundational resource and then applied engineering principles, urban planning concepts, and environmental and social considerations to develop a comprehensive, ethically-informed urban development strategy.

### **Interdisciplinary Environmental Policy Proposal:**

- **Assignment:** Conduct an interdisciplinary study on a significant environmental issue (e.g., water scarcity, deforestation) using AI tools for initial data gathering. Students then create a policy proposal addressing this issue, considering scientific, ethical, and socio-economic perspectives.
- **Proof of AI Incorporation:** Students must include the AI-generated initial data analysis and demonstrate how it informed their policy proposal, highlighting the integration of scientific data with ethical and socio-economic considerations.

### **Healthcare Innovation from Multiple Perspectives:**

- **Assignment:** Use AI to explore a recent technological innovation in healthcare (like wearable health monitors). Students analyze and improve upon this innovation from both engineering and ethical healthcare perspectives, discussing aspects like technological feasibility, patient privacy, and healthcare accessibility.
- **Proof of AI Incorporation:** Submit the AI-sourced information on the healthcare innovation alongside their analysis. Emphasize how they have combined technical aspects with ethical healthcare considerations in their evaluation.

### **Psychological Impacts of Technology Use in Education:**

- **Assignment:** Students use AI to compile initial research on the effects of technology use in educational settings. They then analyze these effects and improve upon it from both psychological and educational perspectives. The analysis should explore topics such as digital learning's impact on cognitive processes, social development in children, and the balance between technology use and traditional learning methods.
- **Proof of AI Incorporation:** The submission should include the initial AI-generated research and the student's comprehensive analysis. Students must clearly outline how they integrated psychological theories and educational principles to evaluate and expand upon the AI's findings, focusing on the nuanced impacts of technology in educational psychology.

## Implement Peer Review and Self-Assessment:

Use peer review systems where students critically assess each other's work, focusing on subjective and qualitative aspects. Include the ethical use of AI by providing peer review sessions which include criteria for evaluating the ethical considerations in the use of AI in assignments.

### Assisted Research Paper:

- **Assignment:** Students individually use AI to gather preliminary research on a chosen topic. They then develop a research paper based on this initial data, incorporating their own analysis and insights. The paper should address both the topic and the ethical considerations of using AI in research.
- **Proof of AI Incorporation:** Submit both the AI-generated initial research and the final research paper.
- **Peer Review Component:** Fellow students review the research paper, focusing on how well the author has integrated AI data with personal research, the quality of analysis, and the ethical use of AI in their work.

### Enhanced Creative Writing Piece:

- **Assignment:** Use AI to generate a creative writing prompt or initial draft. Students then expand this into a full narrative or poem, adding personal creativity and style.
- **Proof of AI Incorporation:** Include the AI-generated prompt or draft and the completed creative piece.
- **Peer Review Component:** Classmates critique the creative work, assessing how effectively the student transformed the AI-generated content into a unique and engaging piece, and the ethical considerations in claiming AI-assisted work as their own.

### Multidisciplinary Project Proposal:

- **Assignment:** Students use AI to generate a basic project proposal in an interdisciplinary field (e.g., environmental policy, health and technology). They refine this proposal, integrating various academic perspectives and considering the ethical implications of the project.
- **Proof of AI Incorporation:** Present the initial AI-generated proposal and the enhanced version.
- **Peer Review Component:** Peers evaluate the proposal, focusing on the integration of different disciplines, the depth of the proposal's enhancement from the AI output, and the ethical considerations of the proposed project.

### Data Visualization Project:

- **Assignment:** Students use AI tools to create initial data visualizations based on a dataset. They then enhance these visualizations to make them more informative, accurate, and ethically sound.

- **Proof of AI Incorporation:** Submit the AI-generated visualizations and the improved versions.
- **Peer Review Component:** Classmates review the visualizations, assessing how effectively the student enhanced the AI's initial work, the clarity and ethical representation of data, and the overall quality of the visual communication.

### Require In-depth Research and Synthesis:

Assignments should demand extensive research and the synthesis of information from multiple sources. Include the ethical use of AI by assigning research tasks that demand an exploration of ethical issues, historical context, and future implications of a subject.

### Globalization and Its Impacts Research Project:

- **Assignment:** Students use AI to gather initial data and perspectives on the effects of globalization. They then conduct extensive research from various sources, synthesizing information to understand the multifaceted impacts of globalization on economies, cultures, and environments, while also considering the role and ethical implications of AI in global data analysis.
- **Proof of AI Incorporation:** Submit both the AI-generated initial data and the comprehensive research paper. Highlight how the AI data provided a foundation for further in-depth research and how ethical considerations of AI usage were integrated into the analysis.

### Technological Advancements and Society Review:

- **Assignment:** Conduct a comprehensive study on a recent technological advancement (e.g., blockchain, AI in education), using AI tools for initial data gathering. The research should cover technological development, societal impact, ethical considerations, and future implications.
- **Proof of AI Incorporation:** Submit the AI-compiled initial data and the final research report. Highlight how the AI-provided information served as a basis for the extensive research undertaken and how ethical considerations were woven into the analysis of the technology's impact on society.

### Interdisciplinary Study on Renewable Energy Technologies:

- **Assignment:** Students use AI to obtain initial insights into current renewable energy technologies. They are tasked with researching these technologies from scientific, economic, and environmental perspectives, creating a report that synthesizes these interdisciplinary views and assesses the future potential and ethical implications of these technologies.
- **Proof of AI Incorporation:** Present the initial AI findings alongside the final interdisciplinary report. Illustrate how the AI-generated content informed the early stages of research and how the ethical use of AI was considered throughout the study.

### Advanced Analysis of Circuit Design Trends:

- **Assignment:** Students use AI tools to gather initial data on the evolution of electrical circuit design, focusing on developments over the past few decades. They then conduct extensive research to analyze these trends, synthesizing information from academic journals, industry reports, and technological reviews. The analysis should cover technological advancements, changes in design methodologies, and the ethical implications of these developments (e.g., sustainability, e-waste management).
- **Proof of AI Incorporation:** Submit both the AI-generated preliminary data and the comprehensive analytical report. Highlight how the AI data provided initial insights that guided further in-depth research, and detail how ethical considerations related to circuit design and environmental impact were integrated into the analysis.

### Include Real-world Interaction and Application:

Encourage tasks that involve real-world interaction, application, and problem-solving. Include the ethical use of AI by encouraging tasks that involve engaging with real-world situations or case studies.

### Community Impact Analysis Project:

- **Assignment:** Students use AI tools to gather initial data on a specific issue affecting their local community (e.g., traffic congestion, public health, urban development). They then conduct fieldwork, such as surveys or interviews, to gather real-world data. Students synthesize both sets of data to develop a comprehensive analysis of the issue and propose practical solutions.
- **Proof of AI Incorporation:** Submit the initial AI-generated data analysis alongside the findings from their fieldwork. Highlight how the AI data informed the direction of their real-world research and how both sources were integrated to create a well-rounded solution proposal.

### Business Market Expansion Strategy:

- **Assignment:** Utilize AI to perform a preliminary market analysis for a local business looking to expand. Students then engage with the business owners, customers, and other stakeholders to gather real-world insights. They create a market expansion strategy that combines AI insights with their field findings, focusing on customer needs, competition, and ethical business practices.
- **Proof of AI Incorporation:** Present the AI market analysis and the final expansion strategy. Detail the integration of AI-generated insights with the real-world data collected, demonstrating a comprehensive approach to business planning.

### Environmental Advocacy Campaign:

- **Assignment:** Students use AI to identify key environmental concerns in their region (e.g., pollution, conservation, climate change effects). Based on this, they design and implement an advocacy campaign, involving community engagement activities. The campaign should integrate AI findings with direct community feedback and environmental research.



- **Proof of AI Incorporation:** Include both the AI-identified environmental concerns and a report on the advocacy campaign. Explain how the AI data helped shape the campaign's focus and how real-world interactions enriched and validated the AI's findings.

### **Healthcare Accessibility Study:**

- **Assignment:** Conduct an initial analysis using AI on healthcare accessibility in a specific area. Students then engage with healthcare providers and patients to gather firsthand information. They synthesize the AI analysis with their field research to evaluate healthcare challenges and suggest improvements, considering both technological and human factors.
- **Proof of AI Incorporation:** Submit the AI-generated healthcare analysis along with the field research report. Show how the combination of AI data and real-world experiences led to a nuanced understanding of healthcare accessibility and informed their suggestions for improvement.